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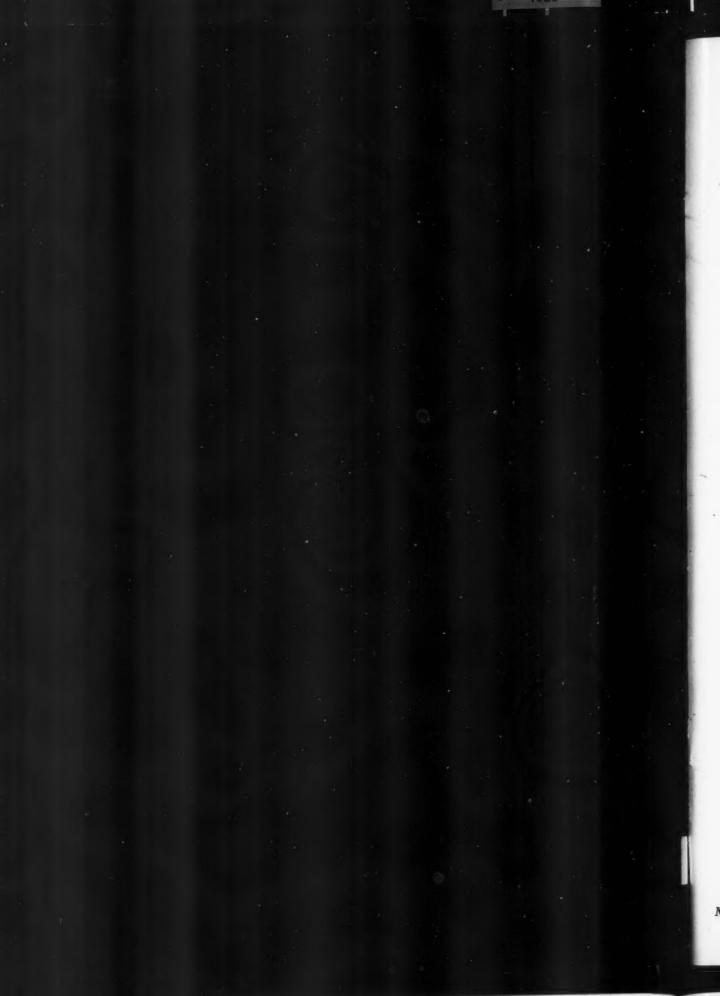
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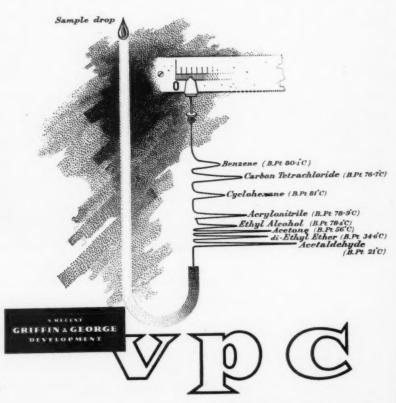
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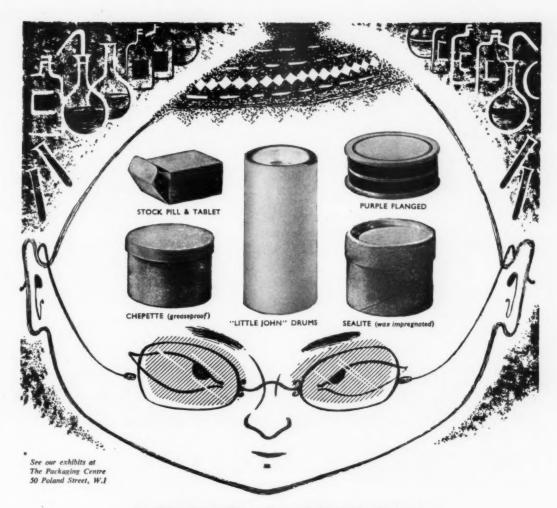
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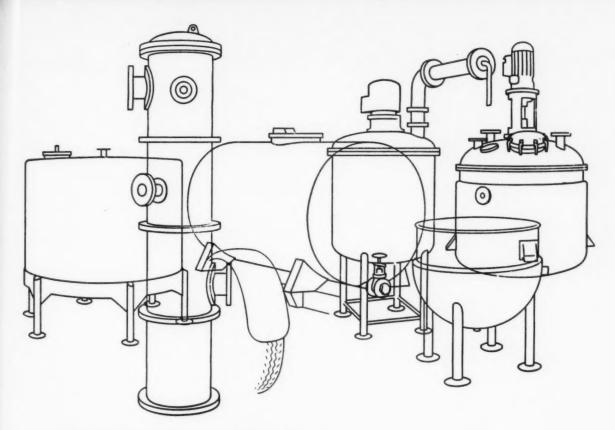
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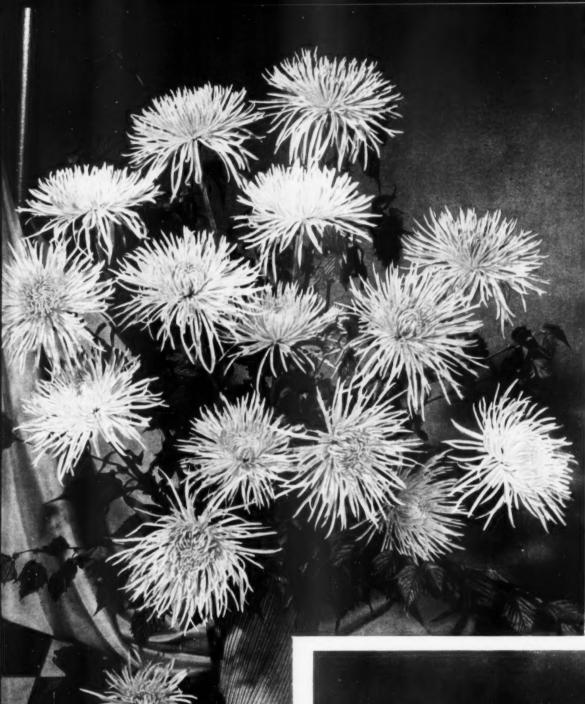
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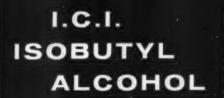
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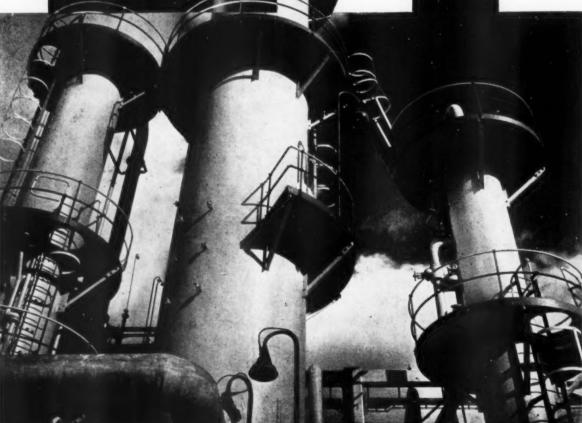
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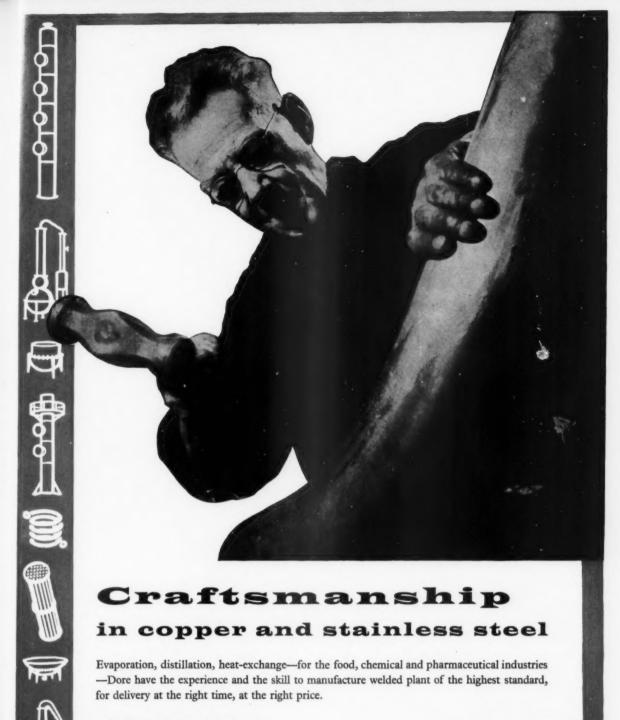
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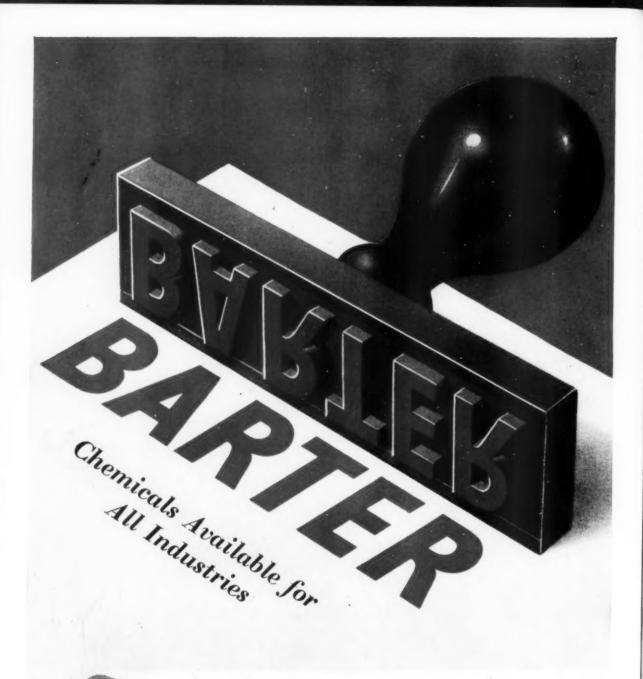
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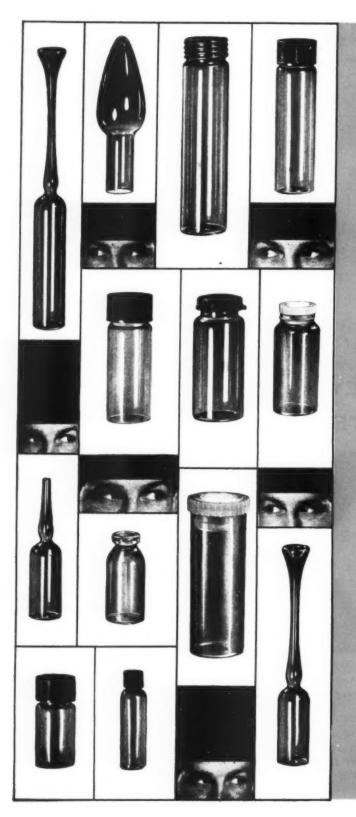
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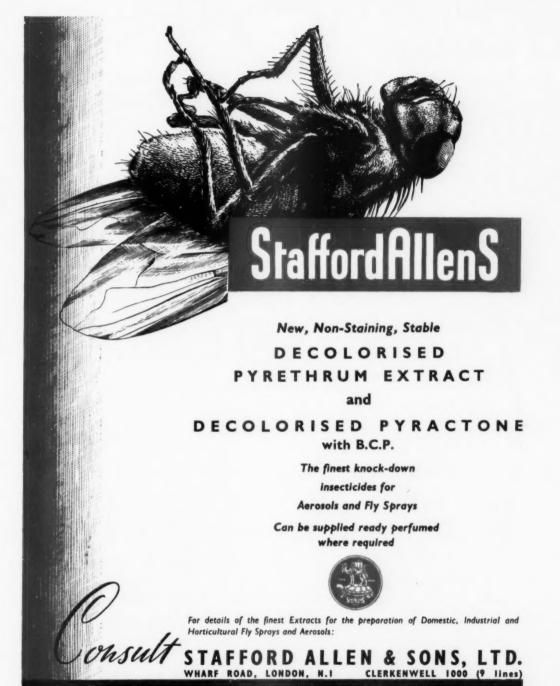
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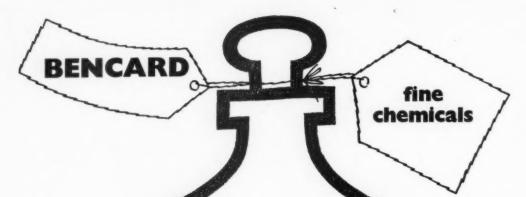
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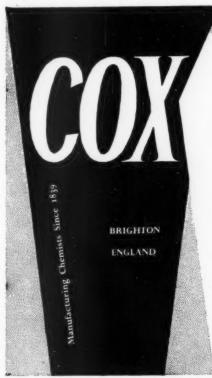
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TOPICS AND COMMENTS

Hinchliffe: the first instalment

The interim report of the Hinchliffe committee on the cost of prescribing, which was issued on June 23, is another attempt to effect a compromise between opposing objectives. Doctors must be allowed to prescribe what they think best, but they must choose the cheapest drugs. The pharmaceutical industry must use less aggressive selling methods, but it must continue to create export records. These aims are irreconcilable. Thus the first instalment of Hinchliffe amounts to no more than a series of minor checks, some of which are likely to be more irritating than effective.

Three of the nine recommendations are of direct consequence to manufacturers. Firstly, manufacturers should be compelled (if necessary by law) to quote prices on their advertising literature circulated to doctors. Secondly, Executive Councils should no longer supply drug houses and advertising agencies with copies of their medical and pharmaceutical lists (for the purpose of circularisation). Thirdly, Approved Names should be given to all drugs, old and new, and these names should be given as much prominence by the manufacturer as his own brand names. Approved Names should be given to all new drugs before they are marketed.

The Association of British Pharmaceutical Industry has already commented on the first and third recommendations. They say that in spite of the difficulties that will be created, especially in the export market, the industry has already voluntarily agreed to include prices in advertising literature. As for the third recommendation, it is pointed out that the committee has failed to appraise the value and importance of proprietary names. If a manufacturer is to continue to spend large sums on research he must be allowed to recover these costs and he can do so only if he can sell his product under a proprietary name.

The other six recommendations are designed to make doctors more price conscious. A comprehensive prescribing handbook giving comparative costs of all drugs, standard and proprietary (there are 5,000 of the latter), should be prepared because many doctors do not know the cost of the drugs they prescribe. "Prescriber's Notes" should be circulated to all clinical teachers, consultants, hospital doctors and final year students as well as to G.P.s. Circulation to doctors of prescribing statistics should be speeded up and more visits should be made by regional medical officers. At present about 700 doctors whose prescribing costs are high are visited each year by R.M.O.s. The status and pay of R.M.O.s should be improved to attract more recruits.

None of the Hinchliffe recommendations do

anything to dispel the widespread and erroneous idea that in prescribing drugs for his patient the doctor has a clear choice between cheap, standard drugs and more expensive proprietaries. This is a misconception, as the A.B.P.I. points out, firstly because many drugs are available only in proprietary form, and secondly because many proprietaries are no dearer than their standard counterparts.

No one disputes that everything reasonable must be done to keep down the cost of drugs in the health service; the bill has increased from £30·3 million in 1949 to £60·9 million in 1957. One major reason for this increase is the shilling prescription charge. Since the shilling per item charge was introduced in December 1956 the number of prescriptions has gone down but the amounts prescribed have increased substantially. The charge has, in fact, defeated its object.

But for all that the committee has found no evidence of extravagance or irresponsibility on the part of doctors. Indeed, they state that the increase in the cost of N.H.S. drugs is proportionately less than in European and Commonwealth countries which have similar, but usually less comprehensive, health services (see Manufacturing Chemist, June 1958, p. 258).

All these facts should be kept in mind by those critics who hurl accusations against doctors and drug manufacturers. The fact is that it is the public who, in the last analysis, are responsible for the mounting drug bill. Any service which is "free" is likely to be abused. If the nation undertakes to underwrite the cost of the people's health it must be prepared to foot the bill. The only way to substantially cut the cost of drugs and, indeed, of the whole service (for drugs are still less than 10% of the total cost) is for the people through Parliament to opt for a drastically curtailed Health Service. Since advocacy of this would be political suicide for any party, doctors and drug manufacturers must just get used to criticism and endless enquiries on the Hinchliffe model.

Keep it dark

THE Society of Cosmetic Chemists is finding that its lecture programmes are being hindered by the refusal of employers to allow their chemists and technologists to lecture. Mr. Jack Pickthall, immediate past-president of the Society, pleaded with employers to change their attitude at the last annual meeting. Of course any editor of a technical journal could have told the Society that it would sooner or later have to face the secrecy barrier. Many firms, particularly in the cosmetics industry, cling passionately to the illusion that their processes and formulæ are unique. They seem to have been carried away by the claims made by their own

advertising and really believe in "secret" ingredients and "unique" processes and machines. In fact the successful firms are often those which within reason, encourage their chemists to give and take freely in matters of cosmetic science and technology. Of course no responsible chemist would divulge genuine secrets to his competitors; why should he wish to harm the company which provides him with a living? Art and science flourish in an atmosphere of free discussion. They should not be stifled by false calculations of commercial advantage.

Anglo-Italian opportunities

The joint congress of the Società Chimica Italiana and the Society of Chemical Industry which we attended last month, and which is reported in this issue, will have achieved a valuable objective if it encourages British chemical firms to forge links with their Italian counterparts. Italy is a country traditionally poor in raw materials, but lately there have been rich discoveries of oil and methane which are providing the basis of a flourishing petroleum chemicals industry. For instance, near Ravenna a large fertiliser plant using natural gas is being developed. Other enterprises are being fostered by Montecatini and the large Italian oil companies.

In pharmaceuticals Montecatini again take the lead with their Farmitalia subsidiary which employs 3,000 people in its Milan and Settimo Torinese establishments and which produces a formidable range of modern drugs. The peculiar patent situation in Italy undoubtedly helped this company to make notable strides, but it would be wrong to overlook the research which it is now carrying out. A new Farmitalia product, for instance, is Cinarina, an anti-cholesterol drug for the treatment of digestive ailments which is based on an acid obtained from artichokes.

One advantage that could accrue from British investment in the Italian chemical industry is access to South American markets which are under the influence of Italian industrialists and technologists.

Risorgimento

No one was more delighted at the success of the Turin congress than Prof. Ernst Chain, F.R.S., that cheerful and brilliant man who came to Britain just before the war and did the historic work on penicillin with Florey at Oxford which earned them both Nobel prizes. It was undoubtedly Chain's close association with Dr. Marotta, secretary of the Società Chimica Italiana, which contributed powerfully to the idea of holding the 8th National Congress in conjunction with the S.C.I. And on the S.C.I.'s side their able foreign secretary, Leslie Streatfield, took up the idea enthusiastically. The result was than no fewer than six Nobel Laureates and a score of other distinguished scientists lent their presence and support to the Congress which brought to-

gether 1,000 people for a week of fruitful social and scientific intercourse.

It is astonishing that Dr. Marotta, besides being secretary of a great national scientific society, is the Director-General of the Istituto Superiore di Sanita in Rome and the member of many national committees. For a man of over 70 his versatility, industry and endurance is remarkable. For 40 years he has worked untiringly for the Società and has succeeded in creating a truly national organisation in place of the many provincial chemical societies in which the Italian chemical profession was previously fragmented. His work in this field may truly be likened to Garibaldi's achievement of the Risorgimento, the unification of Italy.

He has become almost a legend in his own lifetime and we frequently noted during the Congress the almost reverent way in which he was received by his fellow chemists in industry and research.

The Congress was a striking example of the way a large national society can command the support of the profession and industry to put on a first-class show. We fell to wondering whether such a Congress would be possible in this country and, if so, who would stage it. Could it be the S.C.I., the Chemical Society or the Royal Institute of Chemistry. Regretfully we came to the conclusion that not one could match the efforts of a single national society. How different it would be if there was one British chemical society instead of many. Is there any real need today to split the loyalties and strain the pockets of British chemists? From our own observations we are confident that there would be general approval of unification of the various societies into one large, comprehensive and powerful organisation. It seems to work in other countries. Why should we, largely for historical reasons, continue to be different?

Production and control-WHO rules

A NEW factor in the pharmaceutical industry is the increasing attention the World Health Organisation is paying to production methods and requirements. This is developing from WHO's biological standardisation programme.

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In co-operation with more than 100 laboratories in different parts of the world, WHO has so far established about 50 new standard biological preparations, ranging from diphtheria antitoxin to a whole series of antibiotics. This has made it possible for these substances to be measured and described in terms of international units accepted throughout the world. Now WHO has also been charged with the responsibility of recommending uniform requirements for the production and control of some of the most important of these and other substances.

The first result of this new programme is a set of international requirements for the production and control of Salk-type polio vaccines designed to ensure safe and potent products.

Until now, difficulties have often been put in the

way of the free exchange of polio vaccine because of differences in the manufacturing and control nethods applied in the country of origin and in the country wishing to use the vaccine. When finally a cepted, the new requirements, as recommended by the WHO Study Group on Recommended Requirements for Poliomyelitis Vaccine, are expected both to facilitate the international exhange of polio vaccine and to provide guidance and assistance to countries wishing to start production and control of polio vaccine. This is particularly important now because in many countries where polio was formerly rare, there have been severe epidemics in recent years.

Other biological substances such as yellow fever and cholera vaccine, blood and plasma, will be the subjects of similar recommendations for production and control requirements to be formulated by other WHO study groups during the coming months.

Who can use titanium?

THE drastic pruning of Britain's defence budget has severely affected the aircraft industry and with it I.C.I.'s titanium production programme, which was based largely on the anticipated expansion of the use of this remarkably light and strong metal in aircraft manufacture. Faced with an "agonising reappraisal," I.C.I. have decided that now titanium's largest potential market is in chemical engineering where its outstanding resistance to corrosion promises to revolutionise some processes. At I.C.I. Metals Division in Birmingham, J. B. Cotton and his team, have discovered some astonishing facts about the metal's corrosion resistance. For instance, titanium resists seawater corrosion so well that it is claimed it would take 4,000 years' exposure to the tides to corrode away the thickness of a postage stamp. And again, the corrosion rate of titanium in 40 w/w sulphuric acid is reduced from 1 in. a year to less than 0.0001 in. by the application of 50 watts per 1,000 sq. ft. in the system known as anodic polarisation. Anodically protected titanium can now be considered for use in some of the most aggressive environments known to chemical engineers, including hot strong sulphuric acid and phosphoric, hydrochloric, oxalic and formic acids. Another interesting development is the use of platinised titanium anodes for the cathodic protection of steel structures and for electrolytic cells in chemical manufacture.

All-titanium components already in use in the chemical and petroleum industries include gas/liquid nozzles, wet chlorine valves, orifice plates, springs, Hoerbiger-type compressor valve assemblies, pump impellers, filter plates, tower packing rings, agitators, thermometer pockets, resaturator grids and high-pressure needle valves.

The snag in all this promise is the very high price of titanium. Even after the 5 to 20% reductions on the previous prices of £6 per lb. for wrought titanium sheet and £5 per lb. for rod, titanium is still

too expensive for widespread use. The trouble is that until more is bought prices cannot come down. One way out of the dilemma is to line mild steel vessels with thin titanium sheet, using spot welding to secure it. This is certainly a useful way of obtaining the virtues of titanium for a relatively far smaller outlay. (Further details of these developments are given in an article in the July issue of Chemical and Process Engineering.)

If demand can be increased to enable existing plants to be worked to capacity prices could be dropped by 50% and later by another 25%.

I.C.I. have staked a lot on titanium. They have built at Wilton, Yorks., a large reduction plant, at Birmingham a 2,000 tons p.a. titanium melting plant and at Waunarlwydd, near Swansea, a new £3 million plant for manufacturing wrought titanium rod and sheet. Plants of this magnitude seem almost unbelievable when it is recalled that only 10 years ago the world output of titanium was just Today it is around 25,000 tons. 3 tons. doubtedly the heavy expenditure on military aircraft here and particularly in the U.S. has stimulated this tremendous expansion. Obviously the chemical industry cannot completely replace the aircraft builders as customers. But it will not be I.C.I.'s fault if they do not have a good try.

Computer checks chemical structures

ATTEMPTS are being made to use automatic computers to help relieve patent examiners of the drudgery of patent searches. The work is being done by the U.S. Patent Office and the National Bureau of Standards. The task of the patent examiner, of course, is to find whether a claim put forward relates to anything that has been previously patented. This may require a search of anything up to 10 million documents.

The first computer trials have been attempts to search for chemical structures. Over 200 descriptions of steroid compounds were exhaustively searched by a high-speed electronic computer to answer typical questions that might occur in evaluating a patent application. The system used required the numbering of each atom in a structural diagram serially in arbitrary order. One unit of computer storage, called a word, was given to each atom to represent its position in the structure. In each word were listed the numbers of the other atoms, up to four, that were attached to the atom represented by the word. The element symbol and the serial number of the atom were also placed in the word. Thus, each coded atom word was given six fields: the serial number of the atom, four connection fields, and an element symbol.

The search programme tried to make an atom-toatom match between the atoms of the question structure (the structure in the patent application) and the atoms of the first structure recorded in the file. If the machine found that all possible first matches led to irreconcilable mismatches, it rejected the first file structure and proceeded to the next. When a one-to-one correspondence existed between each of the atoms of the question structure and the atoms of part of the file structure that was being examined, the computer printed an indication of the structure that had been found. This process continued until the whole file was examined.

Even with a computer this process can be very tedious. So short cuts are being devised. One is a "screen" stored in the file; it consists of a list of the number of occurrences of each type of atom in a structure. The machine can search this list before it searches the structure to find whether there are enough atoms of the right type present to satisfy the search requirement. This screen enables the computer to reject quickly the vast majority of structures that would otherwise have been searched.

Now that a start has been made it is certain that refinements and improvements will be made steadily, as operators get used to the computer system. If and when computers can be used for routine patent searches the whole process of granting or rejecting claims will be greatly accelerated. There should be no loss of accuracy, rather the reverse.

Beauty's whim

The latest changes in cosmetic preferences are shown in a survey issued by the magazine *Woman*. It is based on a nation-wide sample of 4,227 interviews with women between the ages of 16 and 64 of different social classes, ages, towns and occupations.

Field work was carried out in August and September last year and comparisons were made with a similar survey made during March to May 1955. In all, 39 types of cosmetics were covered and the report is divided into five parts—hair preparations, permanent waves, preparations for the hands, face make-up, and miscellaneous cosmetics.

Details are given of the number of purchasers of each brand, the last time they bought it or whether they had tried it at all.

There was a marked decline in the demand for powder and leaf shampoos; only 7% use this type compared with 12% in the previous period. Preference for liquid or lotion shampoos is evidenced by a 6% increase. Cream shampoos gained 2% in popularity.

Liquid make-up base was found to be more popular than before, the percentage jumping from 6% to 10%. The preference for cake make-up, which is applied with a sponge, has declined by 1%. Cleansing milks and lotions have gained by 1%.

There is a strong tendency towards "all-purpose" creams which are reputed to combine the properties of a foundation cream, skin food and cleansing cream. This is not unexpected because these creams are comparatively cheap. The desirability of this trend is questionable as, on the whole, cosmetics are designed for a specific purpose and the ingredients, as a rule, can do only one job.

Double century

When Johann Rudolf Geigy opened a drug and dye shop in Basle in 1758 he began a business which, two centuries later, was to spread all over the world, embracing no fewer than 50 subsidiary companies and employing some 8,000 persons. Geigy was 25 at the time and he lived another 35 years, seeing his trade flourish. It was nearly 100 years after he started the firm that another J. R. Geigy—his great-grandson—began the manufacturing side of the business. He started with natural dyes and in 1862—not long after Perkin's discovery of mauve—set up a new plant for making synthetic dyes.

Diversification of Geigy's manufacturing programme began in 1930 with the development of mothproofing agents which in turn lead to insecticides and, in 1941, to the fabulous DDT. In 1938 pharmaceutical manufacture began and this is now a major division.

The firm had representatives in Britain as early as 1886, but in 1920 a subsidiary was established in Manchester. Today the British Geigy companies, which include Ashburton Chemical Works, Ltd., James Anderson and Co. (Colours) Ltd., Aliphatic Research Ltd., and Gyl Chemicals Ltd., employ 1,700 people. Products include dyes,

Ltd., Aliphatic Research Ltd., and Gyl Chemicals Ltd., employ 1,700 people. Products include dyes, pigments, pesticides and pharmaceuticals—in particular barbiturates, of which Geigy is one of the largest manufacturers in the world.

Geigy is one of the oldest firms in existence. But its long history is a stimulant rather than a soporific. It has every intention of celebrating its 300th anniversary, *Deo volente*.

Bus rides for soap coupons

Should any detergent manufacturer be looking for a new sales idea (and which one is not?) he might consider the scheme of the B. T. Babbitt Co.

This manufacturer of household cleansers has signed a contract with the New York City Transit Authority whereby every tin of Babbitt cleanser sold in the New York metropolitan area will carry a special coupon. Three of these coupons can be exchanged for a 15 cent fare on the underground trains or buses operated by the Transit Authority. For each coupon it collects the Authority will receive 5 cents from the manufacturer. The Authority has been losing passengers over recent years and it is hoped that this scheme will help win them back. It is anticipated that it will cost millions of dollars

Such a venture would provide a welcome relief to harassed retailers whose work has been greatly increased by coupon customers. It might also commend itself to the London Transport Executive which has suffered heavy losses from the recent bus strike.

The only snag would appear to be that the unions would claim extra wages for the extra clerical work which the scheme might impose on its members. The likelihood of this occurring seems so great that the scheme would be hardly worth the trouble.

WATER TREATMENT No industries are more dependent upon a plentiful and pure supply of water transition that the pharmaceutical and chemical industries. Almost every method available for water treatment and purification finds employment in these industries. At the same time water treatment is of special interest to these industries because of the chemical and chemical engineering problems involved. In the following pages MANUFACTURING CHEMIST presents four articles on water. Firstly Mr. E. L. Streatfield discusses the broad aspects of conservation and utilisation and then considers three relatively new treatment processes: electrodialysis, solar distillation, and precipitation. Then Mr. A. H. Waddington reviews treatment processes of special interest to the pharmaceutical industry. Next comes an article by Mr. P. Hamer on the feedwater treatment for boilers working at pressures up to 1,000 p.s.i., the range which covers most industrial boilers in the U.K. Finally there is an illustrated review of water treatment plant and services.

* * *

Conservation and Purification

A paper on recent developments in the economic utilisation and purification of water was given by Mr. E. L. Streatfield, director of research of Houseman and Thompson Ltd., at the National Chemistry Congress held in Turin, Italy, in June. After discussing water conservation and supply for industry, Mr. Streatfield dealt with a number of promising techniques for water purification. In this abstract of his paper three of special interest are discussed, namely electrodialysis, solar distillation and precipitation.

THE growing shortage of water for industry might be described as a shortage of water in the right places. This results from the growth of industry in a locality, the corresponding increase in local population and the higher consumption of water per capita linked with a rise in the standard of living. Water might be supplied in the form of a grid from areas of plentiful supply, such as mountainous districts, to the areas of shortage, but frequently this is too costly and recourse must be made to conserving the supplies in those areas where the supply is diminishing.

The problem of water conservation can be considered under three

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- (1) Artificial replenishment from other sources.
- (2) Return of as much water as possible from industry to the source.
- (3) The re-use or recirculation by industry of the water it uses.

Points (2) and (3) are alternatives or at least ancillary in that both usually require a high degree of water purification and also effluent treatment in the system.

It is on the third consideration that it is proposed to focus attention, as it is generally felt that it is probable that more water, used in rinsing operations, for cooling purposes or for conveying solids, is wasted in the form of an effluent discharge to waste than is necessary. This is due to the fact that insufficient consideration has been given to whether the water to be disposed of could not be re-used by employing suitable methods of treatment to remove objectionable constituents, or in some cases without any treatment at all.

Three industries where a large measure of the economic re-use of water has been introduced are (a) the steel industry, (b) the electroplating industry and (c) the sugar refining industry.

The steel industry is a large consumer of water and, for example, in rolling mills considerable quantities are used for cooling purposes, mill scale removal and bearing lubrication. The increasing incidence of river pollution has emphasised the necessity for the

greater use of recirculation systems in conjunction with cooling towers. Recirculation systems are in operation in rolling mills, where mill scale and oil are removed by modern sludge blanket precipitation processes and the effluent bleed off is controlled by the permissible concentration of dissolved solids in the circulating water. The make-up water equal to the effluent plus evaporative losses from the system may be as low as 5% of the total water usage.

The problem of the water supply for the electroplating industry and the treatment of surfaces is import-

ant.

That of the disposal of waste water from rinsing baths is none the less so. From 1 to 25 litres per day for each litre of treatment bath is required to carry out the rinsings between successive operations. Both water and chemicals could be conserved by good engineering design, by counter-current rinses followed by evaporation or treatment by ion-exchange to effect recovery of copper, nickel and chromic acid and also the recovery of water of high quality which is recirculated. The

cyanides must be destroyed by oxidation with chlorine.

The sugar refining industry is a large consumer of water. In Eastern and Western Europe alone, where 100 million tons of sugar beet are treated annually, 1,500 million cu. metres of water are consumed every year. The water used for final rinsing and water from the presses is highly polluted, on account of the sugar, proteins, pectins, etc., which it contains. It may be completely re-used at the cost of a slight reduction in yield and a high nonjuice concentration. Schemes for re-use of water coming from diffusions and from presses involve the application of chlorine or pasteurisation. Biological purification and acid treatment are also employed.

Evaporation losses

An important factor in water conservation is the need to avoid all water losses, of which, losses by evaporation are enormous. In Australia the Commonwealth Scientific and Industrial Research Organisation have produced and successfully tested two methods of meeting this problem. Both methods depend on the fact that cetyl alcohol, a fatty alcohol of high molecular weight, spreads a monomolecular film over the surface Evaporation is thus of water. reduced, while rain and oxygen are still able to penetrate. Aquatic life is unharmed and no ill effects result from drinking the treated water.

Electrodialysis

Electrodialysis may be used to separate different salts, to concentrate electrolytic solutions or to remove salts from them. In this process, ion exchange membranes form barriers between different compartments of cells containing electrolytic solutions of different When an electric current passes through the cells, the membranes offer different degrees of resistance to the passage of different types of cations and anions. In electrodialysis the ion exchange membranes act, therefore, as selective barriers and in the limit as "ionic sieves."

Since there is usually no exchange of ions between solid and solution in this case, it might be thought, therefore, that the ion exchange properties of the membranes are merely coincidental and that ion

exchange and electrodialysis have nothing in common. In fact the ion exchange properties and the preferential permeability of the membranes to certain types of ions are related to each other. For if a solid is able to exchange cations readily with a solution, and if this ability extends to all layers beneath the solid surface, then the exchanging cations can migrate in the solid. Hence such a cation exchange material is permeable to cations. Small anions can usually also migrate in the solid, but unless there are large cracks in the solid material, only relatively small amounts of anions can penetrate into it. Thus when an electric potential difference is applied, membranes made from cation exchange materials are permeable to cations and relatively impermeable to anions, unless the equilibrating solutions are very concentrated. Similarly, anion exchange membranes are permeable to anions but relatively impermeable to cations. Electrodialysis is an attractive and promising technique for desalting brackish waters in the range up to 5,000 to 8,000 p.p.m. (mgm./litre) Cl content, the water being desalted to a content of about 500 p.p.m. Cl, equivalent to a salinity which is tolerable to human beings for drinking purposes.

The cell assembly for this process

The cell assembly for this process comprises electrodes placed at either end of a stack of membranes, and on passing an electric current the anions and cations in the water migrate through the appropriate anion selective and cation selective membranes.

In a typical electrodialysis unit a group of membranes of alternating ion selectivity are arranged in a stack between the two electrodes. Gaskets and spacers are placed between each membrane pair and liquor channels are arranged for the flow of salty and dirty streams of Rinse water is also fed separately to the two electrode compartments. In addition, the end electrode compartments are separated from the first membrane by means of a micro-porous separator. This latter refinement ensures that solid deposits formed in the electrode compartments cannot foul the first membrane and also, what is more important, chlorine formed at the cathode cannot penetrate the separator and passes away with the electrode rinsing liquor. Similarly, at the anode, the hydro-

gen and caustic soda liberated are also removed with the rinsing liquor. The complete cell unit is clamped together by holding bolts or some form of strong back device which makes the complete pack a watertight unit. On the passage of an electric current, the product cells become purified and the concentration of salt in the dirty cells rises progressively. In the case of sea water, the concentration in the dirty liquor stream may rise as high as 38,000 p.p.m. Cl content, a small amount of concentrated liquor being bled to waste to ensure that the concentration does not rise above this value.

A number of projects employing electrodialysis for desalting brackish water have been reported. The National Chemical Research Laboratory of South Africa has carried out an extensive programme of work in the application of electrodialysis for the desalting of saline water pumped from the gold mines in the Orange Free State, the water being too saline for disposal to local streams without treatment. The S.A.C.S.I.R. have developed heterogeneous membranes ranging in size from 28×91 cm. to 46×173 cm.

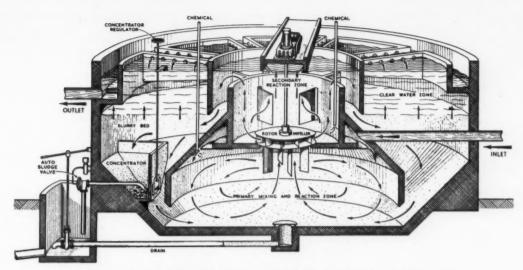
A plant has been constructed by a British firm to operate the batch principle to produce drinking water for the town of Tobruk in Libya. The plant is to have an output of 40 tons of water per day based on the use of 200 membranes, each having dimensions 40×150 cm. In America, plants have been designed as a continuous process. The electrodialytic process has received attention as part of the Arid Zone Programme of UNESCO.

Solar distillation

Distillation using solar energy as the source of heat is likely to be of interest in the arid areas of the world. Studies carried out over the past few years have indicated that the use of solar radiation in equipment of simple design offers the best means of producing fresh water from salt or brackish water at low overall costs.

Due to the low ground heat available, the size of solar distillation equipment is bound to be large and hence investment charges will be the major cost item in this process. It is therefore essential that any equipment designed must be fabricated from cheap materials

(Continued on page 278)



This diagram shows how water supplies are clarified and softened in the Accelator.

Water for the Pharmaceutical Industry

By A. H. Waddington, B.SC., F.R.I.C., M.R.S.H.*

Normally water for the pharmaceutical industry is available from one of three sources; firstly the municipal or town supply, secondly wells and boreholes, and occasionally upland surface water from rivers and streams. In planning a new factory the question of water supply would have been investigated and a suitable source chosen with due regard to quality and costs. In existing factories the towns main will probably have been first choice, although in some factories wells and boreholes are the source of supply. Other articles in this issue deal with water softening, demineralisation and the production of water of high quality for specific purposes, therefore these methods will not be touched upon here.

CHARACTERISTICS of towns main water which may require correction will be the presence of slight turbidity due to pipe deposits or corrosion products, the presence of traces of iron and manganese in quantities much less than would be found objectionable for normal potable purposes, slight residual colour and occasionally free residual chlorine. In the case of borehole waters, omitting hardness, these waters may frequently be of low pH value, have a high free carbon dioxide content and contain traces of iron and manganese. Upland surface waters are likely to be coloured and turbid and to have a very high oxygen absorbed value indicating

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* The Paterson Engineering Company Ltd. oxidisable organic matter. Such waters will require full-scale treatment consisting of chemical mixing, coagulation and frequently settlement, followed by filtration either through pressure or rapid gravity type filters. However, in view of the relatively small volumes of water of this quality required in most factories, such elaborate and costly treatment would not be considered, and recourse would have been made either to the towns main supply or to borehole supplies.

In some ways the requirements for the pharmaceutical factory are not dissimilar to those for the soft drinks industry where it is essential for water to be clear, colourless, neutral or slightly alkaline in reaction, free from iron and residual

chlorine and preferably fairly soft. Many town supplies used for the pharmaceutical industry would be greatly improved by being treated in a similar manner to that normally adopted by the beverage industry. Assuming that the public supply has been obtained originally from moorland or upland surface sources and is therefore soft, that its pH value has been corrected to prevent corrosion and that it has been filtered and chlorinated, then in order to put the final polish on it for specific industrial use, treatment can be given as follows.

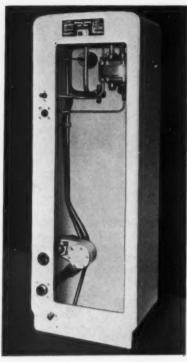
A complete and compact plant

Assuming the water to be soft it is treated with aluminium sulphate and chlorine or alternatively with

ferrous sulphate and chlorine (chlorinated copperas), the latter being added in such a manner that the chlorine is allowed to react with the ferrous sulphate for 2 to 3 min. before the mixture is added to the water undergoing treatment. The water so treated is then passed into a sludge accretion process tank such as the Accelator and allowed to react and settle for 11 to 2 hr. Afterwards it can be passed through a sand filter where such precipitate that has not settled in the main tank is removed and the clear, colourless water, probably containing a slight excess of chlorine, is passed through a filter containing granular activated carbon which removes all traces of chlorine, and eventually before use the pH value is adjusted to any required figure above neutrality by the addition of soda ash. The final water from such a process would be clear, colourless, neutral in reaction, free from all residual sterilising agent, of low oxygen absorbed value and free from iron.

The Accelator incorporates the well-known sludge accretion process which enables the normal processes of mixing, coagulation and sedimentation or precipitation softening to take place in a tank of only about one-half the capacity that would be required by the older methods. Its design differs from other types of sludge accretion tanks in that not only are the chemicals, water and slurry intimately mixed by mechanical means, but also this mixture is circulated around the tank two and a half to three times by means of a rotor impeller. For this reason the Accelator can employ successful and reliable rates in excess of those used by the more conventional sludge accretion process tanks, thus again permitting smaller tanks to be used. Quite obviously neither the Accelator nor for that matter other types of sludge accretion process tanks can be employed where waters are very heavily silted and in such cases the use of circular clarifiers fitted with mechanically - operated sludge scrapers would certainly be recommended.

A distinctive feature of the Accelator is that chemicals are introduced into a primary reaction zone and that the reaction takes place in the presence of previously formed precipitates which enable a floculent or granular precipitate to be formed very rapidly. From



Rear view of the CE chlorinator or dechlorinator type NM; capacity 0.0125 lb. to 40 lb. per hr. for either chlorine or sulphur dioxide.

the primary zone the water with its contained precipitate passes to the mixing and reaction zone and after slow stirring finds its way to the secondary reaction zone or outer draught tube where the slurry mixture is discharged outward and downward on to the surface of the slurry pool. The precipitates are removed from the slurry and its concentration controlled by allowing excess solids to settle and thicken in the hopper-like concentrators from which the thickened sludge is periodically and automatically drawn off. A special rotor-impeller produces a powerful hydraulic action in the primary mixing and reaction zone; its design is such that large volumes of water are moved at a relatively low velocity so as to avoid breaking up any pre-formed floc. Consequently the slurry circulation and mixing is under positive and adjustable control.

Such a plant to deal with upwards of 2,000 gal. per hr. (installations range from 1,000-160,000 gal. per hr.) can be designed to occupy a relatively small space and also to operate by unskilled labour, occa-

sional chemical control and routine control tests only being needed.

If the towns main water requiring treatment contains a large amount of temporary hardness, then lime softening can be incorporated in this system using chlorinated copperas or aluminium sulphate and activated silica as the coagulant. Such water would not require pH correction after filtration, but might require stabilisation either by the addition of a small trace of sulphuric acid or a small dose of a proprietary polyphosphate.

If the town supply is suitable apart from colour and/or turbidity, then the water can be treated with a small dose of alum and chlorine, pressure filtered and finally passed through an activated carbon bed as a dechlorinating unit.

When a water has an excess of free CO₂ producing a low pH, then such water should be aerated and/or neutralised prior to filtration and finally filtered through a carbon filter, assuming chlorine has to be removed. Alternatively if the water only shows signs of corrosiveness, neutralisation either with caustic soda or soda ash will be all that is required.

Pressure and rapid gravity filters

Considerable confusion exists as to when to use pressure filters and when to use rapid gravity filters. Frequently pressure filters are chosen when rapid gravity filters would have been better. The actual rating on a pressure filter and on a gravity filter is very similar, namely from 70 to, say, 120 gal. per sq. ft. per hr. The main advantages of pressure filters are that they are less expensive to build, and the fact that the water passing through them is under pressure often eliminates double pumping. They are of two types, namely vertical or horizontal. The vertical filters are available up to 10 ft. in diameter. but it is usual to limit the diameter to 8 ft. and to build a number together working in parallel for higher volumes of water. This also has the advantage that when one filter is shut off for washing, the water passing through the remainder can be used for washing the filter out of service. Thus if there are three filters and one is shut off for washing, the water from the two in service can be used to wash the dirty filter.

Another type of pressure filter is the horizontal filter. These again

are normally some 8 to 10 ft. in diameter and up to 20 ft. long. For long filters such as these the washing is generally carried out sectionally so that one-half or one-third of the filter is washed at a time. This method of washing enables the rate of wash water to be kept within smaller and more economic limits.

Another disadvantage of pressure filters is that in operation they are closed chambers and consequently it is not easy to inspect either the filtering material or to observe the wash water efficiency. Again there is a definite limit to the amount of suspended matter that can be passed on to a pressure filter, and if pressure filters are installed in connection with settlement, double pumping is obviously necessary and any flocs or suspended matter leaving the settlement tank are broken up.

Rapid gravity filters

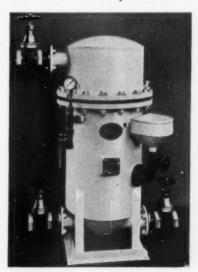
Rapid gravity filters, on the other hand, are usually made of concrete and can be built side by side with common dividing walls in batteries. The internals of a gravity and a pressure filter are very similar. They contain a filter floor upon which is the main header carrying laterals which are used both for the collection of the filtered water and also for the distribution of air and wash water. In the modern filter these headers and laterals are non-corrosive. Above these are placed graded pebble, gravel and grit to a depth of some 18 in. which support the bed of graded sand which is the filter media. The filter media will vary in depth between 18 in. and 27 in. All filters are fitted with wash water troughs and most are fitted with loss of head gauges, and in more elaborate installations with filter controls, and even with filter control tables, from which all the operation of washing and manipulation of valves can be carried out. A modern development in this respect is the introduction of the siphonic wash which enables the coarser and heavier material, which tends to remain close to the surface of the sand, to be removed during the washing process. The washing process is simple; first of all there being a short air agitation of the bed by means of compressed air, followed by a reverse flow of water, namely wash water which floats off the loosened impurities into a wash water trough, and so to waste.



The one moving part of this Paterson dry chemical feeder is the revolving feed table which is rotated at constant slow speed below the stationary feed hopper.

Iron and manganese removal

If the water is clear and unaerated quite large amounts of iron can be removed by a cation exchanger working on the sodium cycle, back washing and regeneration with sodium chloride being used. If, on the other hand, the iron and manganese are present as bicarbonates or partially in suspension, the water will require aeration, lime treatment to raise the pH value, and if manganese is present the pH value will have to be raised to a figure of not less than 9.6. followed by settlement and filtration through a media incorporating an iron removal mineral. Only very occasionally will it be found that aeration alone is sufficient to raise the pH value and precipitate iron so that only filtration is



The Stellar filter B.

required. In a few cases manganese can be precipitated by super chlorination.

Chemical feeding-dry feeders

Many changes have been made in the methods of feeding chemicals to water and in many cases now the chemicals are fed and measured in the dry state, being made into solution after measurement and carried away by an auxiliary stream of water to the point of application. The volumetric type of feeder is shown in the illustration and the operating principle of the feeder is so simple as to ensure a high degree of accuracy, efficiency and freedom from mechanical troubles. only moving part of the feeder is the revolving feed table which is rotated at a constant pre-set slow speed below a stationary feed hopper by means of an electric motor, Pelton wheel or belt drive. The sectional feed knife extending into the chemical within the base of the hopper deflects a constant volume of reagent from the table to a vortex mixer alongside. The quantity so deflected is determined by the position of the feed knife or knives. The position of this knife is instantly adjustable by positive external control while the machine is running. Where large quantities of chemicals are involved an extension hopper is provided so that there need be no interruption in the feed when the feed hopper is running low. Moving agitators are provided either within the feeder hopper or on the side of the hopper in order to prevent arching and packing. Among chemicals which can be fed are sulphate of alumina, hydrated lime, soda ash, sodium aluminate, ammonium sulphate, carbon, chalk, copper sulphate and sodium chloride. Many feeders of this type have been used in the pharmaceutical industry.

These feeders are available in two sizes. Thus, for instance, assuming hydrated lime to be used, the small type feeder will feed from 0·15 to 150 lb. of chemical per hr. and the second larger size will feed from 0·5 to 500 lb. per hr.

Dechlorination

It has already been mentioned that a carbon filter can be used for the dechlorination of water, but another method is available for ensuring the sterility of a water for use in the pharmaceutical in-

dustry. This would consist of adding an excess of chlorine to the water and allowing it to pass through a contact tank of from 30 to 60 min. retention (this contact with an excess of chlorine will often in addition reduce the colour of the supply). On leaving the contact tank the water containing appreciable chlorine can be dechlorinated by the addition of sulphur dioxide which will destroy all or part of the residual chlorine as desired. In certain cases the use of sulphur dioxide as a dechlorinating agent may be preferred to carbon.

Stellar filtration with diatomaceous earth

Frequently an industry finds that it requires a very small volume of colourless, perfectly clear and sterile water. This degree of purity may be achieved with the Stellar filter, which consists of a number of wirewound candles suspended from a base plate in a container designed to withstand the required pressure and fitted with an inspection window. These filters are given a pre-coat of a special filter powder (diatomaceous earth) and if required more filter powder can be added with the raw water passing into the filter in order to extend the length of runs between cleanings. This diatomaceous earth powder. which is specially chosen and available in different grades, forms a very fine filtering mat upon the windings of the filter. Such windings can be made of any suitable metal such as Monel metal or stainless steel, or even of plastic thread. Filters can be designed to resist practically any chemical fluid. The water issuing from the filter will be perfectly clear, but it may contain colour or even not be sufficiently sterile for the purpose required. These factors are taken care of by treating the raw water in a tank with aluminium sulphate and/or alkali, allowing the treated water to settle for 3 to 4 hr. and drawing off, through a floating arm by means of a pump, the settled water to the filter. If necessary the filter powder can be silverised, which will sterilise the water passing through, or powdered activated carbon can be incorporated with the powder so as to remove any excess sterilant in the original water. These filters are fitted with an Autopact compressed air cleaning device, occupy little space and

are ideal for producing a highquality water from suitable raw water sources, and for the removal of solids from various chemical solutions.

It is hoped that this article will have shown that many of the water problems of the pharmaceutical industry can be solved by the application of standard well-tried methods of purification or by such methods suitably modified by experienced engineers and chemists.

of construction. The basic process

(Continued from page 274)

CONSERVATION AND PURIFICATION

is itself quite old and one installation capable of producing up to 30,000 litres per day of fresh water was in use in South America as early as 1872. These units had sloping glass plates that allowed the sunlight to pass through and be absorbed by the brackish water. The water vapour formed condensed on the underside of the glass plates and drained down to a collection trough. This early unit had a glass area of some 5,000 sq. m. Developments during recent years have been concerned with the use of plastic materials for low construction cost and various methods of improving the heat transfer between the energy source and evaporating water. In work being carried out

constructed from plastic materials may find their greatest value in relatively small unit equipment for the supply of say up to 5,000 litres per day of fresh water.

Other designs based upon an entirely different approach offer interesting possibilities. Here, the distiller is of concrete, built directly on the ground and without the

in America, Telkes and Bjorksten have used a black porous medium

saturated with the salt or brackish

water as a means of improving the

heat absorption rate. Solar stills

on the ground and without the usual bottom insulation. The basin so formed may contain up to 30 cm. depth of water rather than the shallow depth used in the older type of equipment. The large basin is subdivided into a series of smaller basins by means of precast concrete curbs, which also provide the support for the glass covers and condensate troughs. The glass covers are sloped at a low angle (10°) up

are sloped at a low angle (10°) up to a central ridge support, rather than at the more conventional 45° angle of slope. The compartments are so arranged that heat exchange can be obtained between the incoming and outgoing liquid streams. The design offers considerable advantages for a large-scale unit and construction costs should be reasonably low.

Precipitation processes

To conclude his lecture Mr. Streatfield briefly mentioned precipitation processes used in the softening of water or in the removal of suspended matter by sedimentation. In these processes the rôle of coagulants is very important. The use of aluminium sulphate, an amphoteric electrolyte, has been supplemented by the addition of polyelectrolytes, such as polyacrylates and other high molecular weight compounds. Tannic acid has been used in conjunction with lime to give calcium tannate and has been an effective coagulant in the treatment of radioactive wastes. use of activated silica to seed the flocs produced by aluminium sulphate is another development of recent years. These compounds are all designed to give heavier flocs which will settle more rapidly in carefully designed sedimentation tanks, and it has generally been found that there is a saving of chemical coagulants by this combined treatment. The use of the sludge blanket technique to trap the flocs in upflow tanks with low final upflow velocities of 2.5-5 cm./ min. has proved to be very satisfactory.

Laboratory Equipment. A new 82 pp. catalogue gives details of a representative selection of equipment from the range of J. W. Towers and Co. Ltd. It includes thermostat units, glove boxes, hydrogenation apparatus and distillation apparatus.

Kjeldahl Apparatus (Supplement No. 5). Accompanying this new supplement to the *Quickfit* catalogue published by Quickfit and Quartz Ltd., is a revised price list showing the lower prices of 25 pieces of laboratory equipment in common demand.

Croda Digest. Issue No. 6 includes formulations for shampoos, hair straighteners, a permanent waving cream, and an aerosol shave cream. The pharmacy section gives a formula for polyoxythylene sorbitan monoesters. There is also a section on polishes.

Hygrotherm. A brochure published by Hygrotherm Engineering Ltd., will interest chemical engineers concerned with heat transfer problems.

Boiler Feedwater Treatment

By P. Hamer, B.A., A.I.C.*

The author deals principally with feedwater treatment for boilers working at pressures up to 1,000 p.s.i., since this range covers the majority of industrial boilers in the U.K., but there are some references to conditions needed in higher pressure boilers. Boiler pressures as high as 4,500 p.s.i. have been or are about to be used for power generation, and these very high pressures are presenting some water treatment problems which have not yet been fully worked out.

THE salts in natural waters have certain well-known effects in boilers, namely scale formation on heating surfaces, corrosion in all parts of the boiler plant, and contamination of the steam with boiler salts and gases, which may cause deposits and corrosion in superheaters, turbines, and on other metal surfaces on which steam condenses. These effects are interlinked by the fact that any treatment applied to the feedwater to eliminate one of them usually affects the others. Furthermore, the water as it passes through the boiler plant to emerge as steam is subjected to three stages of heating and one of cooling, in each of which special effects are produced. For example, in the first stage the water is heated, usually without evaporation, to temperatures of the order of 100°-150°C., in a feedwater heater or economiser, or both, in which it is passed through tubes heated by steam from the turbine or flue gases from the boiler furnace. Here, temporary hardness due to bicarbonates breaks down into calcium carbonate and basic magnesium carbonate which deposit on the metal, and carbon dioxide gas which, together with the dissolved oxygen, can corrode metal unprotected by deposits.

The water then passes into the boiler drum, where it is heated almost instantaneously to the boiling-point, i.e. 170°C. at 100 p.s.i. and 286°C. at 1,000 p.s.i. gauge, and is evaporated to the extent that the residual water, called boiler water, contains the salts in the feedwater concentrated about 6-200 times. These two conditions lead to the crystallisation on the metal of substances such as calcium sulphate, calcium and magnesium silicates, etc., as hard adherent

The steam then passes through
* Imperial Chemical Industries Ltd.,

Alkali Division.

Hard calcium sulphate scale formation in a water tube boiler. The gaps and cracks in the scale are due to pieces being removed for examination and then replaced.

the superheater in which, for power generation, its temperature may be raised to as high as 450°-500°C. Carbon dioxide and oxygen present in the steam originating in the feedwater, together with small quantities of boiler water salts carried over by foaming or spraying, can cause corrosion and deposits in the superheaters, and in the turbine as the steam expands and cools. The gases will also make the condensed steam acid, so that when it is returned to the boiler as feedwater it can carry with it iron oxides and copper salts derived from the corrosion of pipelines, tanks and pumps.

The treatment of boiler feedwater must therefore be considered as a whole, in the light of the possible effects at all points of the boiler plant and beyond to the turbines or space heating system, or wherever the steam is used. The aim of the treatment is to control the chemical reactions taking place between the salts in the water and between water and metal, the treatment chemicals and methods of application being chosen to suit the composition of

the water and the operating conditions of the boiler.

I now propose to discuss the principal methods of treatment to prevent scale, corrosion and impurities in steam.

Prevention of scale

The scales formed in economisers and boilers have a low thermal conductivity estimated at between 8 and 24 B.T.U./sq. ft/hr. °F., so that the metal under them is not properly cooled and in the hotter parts of the boiler its temperature rises to the softening point after which the tube bulges and splits. In furnace wall and other tubes exposed to radiant heat, when rates of heat transfer and evaporation are high hard scales no thicker than 0.1 in. can cause failure. The direct loss of heat or waste of fuel caused by scales has been estimated at about 2% or less in water tube boilers, but may be up to 5% or 6% in smoke tube boilers where heating surfaces are short. The major losses are the cost of replacing burst or bulged tubes, the interruptions in plant operation and the fuel needed to start up a spare boiler.1

The chief constituents of the deposits are calcium and magnesium compounds, so that the logical first step is to remove calcium and magnesium in a softening plant or, if the hardness is not too high, by precipitating them in the boiler itself. The choice of softening process needs some care and depends on the composition and temperature of the raw water, the boiler pressure, and the use to which the steam is put. The modern tendency is to use the purest water at the highest boiler pressure, though it is not clear that this is essential. I cannot go into the details affecting this choice here; suffice to say that although each process removes calcium and magnesium the amounts

of other salts present are altered to a varying degree. Broadly speaking, the best choice is the process which results in a substantial reduction in dissolved salts and silica, and the least amount of CO₂ in the steam.²

Boiler feedwater conditioning. There is always some residual hardness in a softened water and this, together with small amounts of hardness due to contamination of returned condensate or by leakage of turbine condenser cooling water, can cause scale. Small amounts of chemicals are therefore added to counteract scale formation and to adjust the composition of the feed and boiler water to prevent corrosion. This process of adjustment is generally known as "conditioning."

To prevent scale at boiler pressures below about 200 p.s.i. sodium carbonate is used, since it precipitates calcium as carbonate and is also partly decomposed at these temperatures to NaOH, which precipitates magnesium as hydroxide. These substances being of very low solubility form soft sludges which can be removed from the boiler in the blowdown.

At higher boiler pressures the extent of the decomposition may make it difficult to maintain the required concentration of carbonate in the boiler water, and sodium phosphate is used since the PO4 ion is stable at all boiler temperatures and calcium phosphate also forms a soft sludge. Magnesium is precipitated as hydroxide, and if there is not enough OH ion in the softened water for this purpose NA2CO3 or NaOH must be added. Phosphate should be added in amounts to exceed the calcium hardness and maintain an excess of 75-150 p.p.m. Na₃PO₄ in the boiler water as a temporary reserve against unexpected variation or intrusion of hardness.

Softening in the boiler. The practice of adding chemicals direct to the boiler to soften and condition the feedwater inside the boiler has long been known. It avoids the cost of a softening plant, but owing to the amount of sludge formed it has usually been limited to waters of moderate hardness (up to 150 p.p.m. CaCO₃) and boilers working at pressures up to about 300 p.s.i.

The general procedure is, first, to add a small amount of "Calgon," or a mixture of "Calgon" and tannin, continuously to the raw water feed,

to delay the precipitation of Ca and Mg in the economiser; then to add precipitating chemicals, sodium carbonate or phosphate or both, sometimes mixed with tannin and antifoam, direct to the boiler. Thus, the temporary hardness is precipitated by the heat and the permanent hardness by the chemicals.

When this treatment is properly carried out the hardness is precipitated as a sludge which should be removed by the bottom blowdown cock in the boiler, and this control of the amount of sludge is important.

A difficulty with this treatment in the past has been the control of the mobility of the sludge, and many cases are known in which part of the sludge has stuck to the boiler heating surfaces and the rest has compacted in the bottom of the boiler and has been difficult to

A study which has recently been published³ has shown a relationship between the mobility and composition of the sludge obtained by carbonate treatment, and by means of which the sludge can be made free-flowing and the heating surfaces kept clean. This relationship does not hold when phosphate is the precipitating chemical, but with carbonate treatment there are two conditions to be fulfilled:

(a) The magnesium hardness of the feedwater must be kept above a certain minimum level, which is related only to the calcium hardness and silica content and is expressed in the formula

$$X = \frac{100}{CaH} \left(\frac{MgH}{3} - SiO_2 \right)$$

where CaH and MgH represent Ca and Mg hardness in p.p.m. CaCO₃, and SiO₂ is the silica content in p.p.m. X is a dimensionless quantity which should be kept above 7·0. The usual way of adjusting this is to add a magnesium salt.

b) The total carbonate alkalinity in the boiler water should be between 200 and 300 p.p.m. CaCO₃ with 300 the preferred figure.

The process has been applied to many boiler plants working at medium pressures with a great improvement in cleanliness, but, as it is still regarded as a new development, it is strongly recommended that expert advice should be sought before applying it.

Prevention of corrosion in boilers

Boiler steel and water react at boiler temperatures liberating hydrogen, and forming magnetite as an adherent layer on the metal which protects it from further attack. A break in this layer produced by chemical action, or thermal or mechanical shock, will expose the underlying steel to further attack. The subsequent events will be determined by the chemical and physical conditions at the break, because if these favour the formation of fresh nuclei of magnetite close to the break the magnetite layer will be self-healing, whereas if they form a short distance away corrosion may persist and the hydrogen evolved may embrittle the metal.4

It is known that alkalies such as sodium phosphate and caustic soda reduce corrosion, though high concentrations of the latter may dissolve the magnetite, and dissolved oxygen promotes it, so that the best way of reducing corrosion in boiler plants to a minimum is to maintain an alkalinity in the feed and boiler water and to remove dissolved oxygen from the feedwater.

At boiler pressures below about 200 p.s.i. experience shows that adequate protection is secured if the alkalinity of the boiler water is kept at about 15-20% of the total salts, and the $p{\rm H}$ of the feedwater is not less than 9.

Above 200 p.s.i. the safest course is to reduce the oxygen content of the feed to at least 0.05 p.p.m. and at 1,000 p.s.i. and above to less than 0.01 p.p.m. by deaeration under vacuum or at high temperatures, and as an extra safeguard it is customary to supplement this by the addition of reducing agents such as sodium sulphite or hydrazine to remove last traces of oxygen and to deal with unexpected contaminations. The proportion of anhydrous sodium sulphite (100%) to oxygen needed is 8:1 by weight and it is usual to add excess to maintain a concentration of 30-50 p.p.m. Na₂SO₃ in boilers at pressures up to 1000 p.s.i. and 10 p.p.m. or less at higher pressures. Catalyst mixtures containing cobalt salts are now available to hasten the reaction with oxygen. The proportion of pure hydrazine needed is 1:1 (commercial hydrate about 3:1). An excess of about 150% is required to expedite the reaction and the concentration in the boiler water recommended is about 0.05 p.p.m.

Hydrazine is probably more suitable for pure feedwaters and high

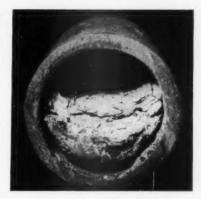
pressure boilers.5

Corrosion in the absence of oxygen. In practice it has been found that corrosion sometimes occurs when the oxygen content of the boiler water is very low or even absent, and it is believed that this attack is largely due to the action of concentrated boiler salts trapped within piles of loose deposits of say calcium phosphate, or iron oxide lying in boiler tubes. The remedy is, of course, to improve water treatment to reduce the amounts of calcium phosphate and iron oxide entering the boiler and to improve water circulation. Other cases are reported to have occurred in clean tubes subjected to high heat input, and it seems wise to design the boiler with too much rather than too little heating surface and to

avoid local hot spots.⁶

Caustic cracking. This type of corrosion has been described many times and, despite a great deal of research, the mechanism is not fully understood neither is it possible to guarantee that the standard remedies will be invariably successful. The riveted seam in the boiler drum is the point of weakness, and when boiler drums are welded and stress relieved the trouble is avoided. On the water side the usual recommended safeguard is to maintain the ratio Na2SO4/NaOH in the boiler water above 2.5. Sodium nitrate has also been recommended as an inhibitor, but not for boiler pressures above about 600 p.s.i. The amount used should provide a ratio NaNO₃/total alkalinity in the boiler water expressed as NaOH, greater than 0.4. In some waters the natural sulphate or nitrate contents are enough to fulfil these conditions. The most certain method of protection is to destroy all NaOH in the boiler water by the addition of "Calgon" or other acid phosphates, so that the alkalinity of the boiler water is entirely due to sodium phosphates, but this treatment may be expensive if the NaOH in the boiler water is high, and it requires a little more chemical supervision than the addition of nitrate or sulphate.⁷

Corrosion in idle boilers. When boilers are drained and allowed to stand there is bound to be some corrosion of the wet metal surfaces especially underneath soft deposits or loosened scale. Although this attack is usually superficial it is



Corrosion occurring underneath deposits in a high-pressure boiler, 900/lb.sq.in.

believed that by repetition it can sometimes become more deep-seated and localised, persisting during running and leading to perforation. For long periods of standing it is therefore recommended that after hosing down to remove sludge and detach any partially loosened scale the boiler should be thoroughly dried out with hot air and then closed up with trays of quicklime in the drums to keep the atmosphere dry. For short periods the boiler can be filled up to the top with alkaline feedwater dosed with sodium sulphite or hydrazine 200-300 p.p.m. The solution strength should be checked once per week and when the boiler is required the level can be lowered below normal working and the boiler blown down fairly freely for a day or two to get rid of excess chemical.

Prevention of corrosion and deposits from steam

Corrosion in space heating systems, closed boiler feed systems and other places where steam condenses can be severe and is due to carbon dioxide and oxygen in the steam. The preliminary countermeasures are to remove oxygen down to about 0.05 p.p.m. and to reduce the carbonates in the boiler water and bicarbonates in the feed, which are the sources of CO₂. Should the amount of CO₂ in the steam be small but still enough to cause some corrosion, this can be countered by adding volatile alkalies in the form of ammonia, cyclohexylamine, or morpholine, to the boiler water to neutralise the CO, and raise the pH value of the condensate to 9.8 Alternatively the problem may be solved by spraying into the steam an aqueous emulsion of a long-chain

amine, such as stearylamine, which is carried by the steam and forms a protective film on the metal surfaces. This is known as a filming amine treatment and both methods have been used successfully in the United States and are now being used here.⁹

Deposits. Solids are introduced into steam either by entrainment of boiler water or dissolution of silica in saturated and superheated steam at high pressures. The entrainment, or "carryover," of boiler water salts can be promoted by various circumstances operating together or independently-for example, high water levels, sudden changes in steam load, leakage past baffles in the steam/water drum, and the high concentration of dissolved salts and suspended solids in the boiler water. It seems to be established that for a given set of steady boiler operating conditions "carryover" increases rapidly when the concentration of dissolved salts exceeds certain figures, and Table I gives a rough indication of these critical concentrations in boilers on steady load and at or below the boilermaker's recommended maximum continuous rating.

Table 1

| Boiler pressure | Maximum dissolved salts in boiler water | | |
|--------------------|---|--|--|
| 0-200 p.s.i. | 15,000 p.p.m. (Economic boilers 4,500 p.p.m.) | | |
| 200-300 ,, | 15,000-5,000 p.p.m. (may be 3,000 p.p.m. in highly rated boilers) | | |
| 300-600 | 5,000-2,500 p.p.m. | | |
| 600-900 ., | 2,500-1,500 ,, | | |
| 900-1,500 ,, | 1,500-500 ,, | | |

Antifoams. The usual practice is to control the concentration of salts in the boiler water at or below the above figures by adjusting the boiler blowdown. There are now available, however, various antifoams which, when added continuously to boiler feedwater, prevent foaming and carryover at much higher concentrations of salts than those shown in Table I and so can effect savings in blowdown. For example, in trials on locomotives, concentrations of 12,000-20,000 p.p.m. and above could be maintained where in the absence of antifoam serious carryover occurred at 3,000 p.p.m. To establish the cause of "carryover" often needs skilled investigation and it is therefore recommended that expert advice should be sought before adding antifoams.

immediately after the war a number of cases of very hard deposits of pure silica on turbine blades were reported from America.10 They occurred in the low-pressure end of condensing turbines at temperatures below about 500°F. and had to be removed by sand blasting or dissolving in hot concentrated NaOH. Subsequent experimental work in Germany and U.S.A. showed that at boller pressures above about 1,000 p.s.i. silica in boiler water dissolves in the saturated steam, and redeposits as the steam becomes super-saturated with SiO, due to expansion and cooling in the turbine. It now seems agreed that there is danger of these deposits if the SiO, content of the steam leaving the boiler is greater than 0.02 p.p.m., and the figures in Table 2 taken from recent American work¹¹ show the maximum SiO, in boiler water needed to give 0.02 p.p.m. SiO₂ in steam. To avoid these deposits SiO₂ may have to be removed from the feedwater, or its concentration in the boiler water controlled by blowdown. The figures in Tables 1 and 2 should therefore be used together for the control of boiler blowdown.

Conclusion

In this article I have attempted to present an overall picture of the principles and methods of boiler feedwater treatment with some indication of the practical steps needed to carry them out. To summarise:

(1) Softening process should be chosen to yield:

- (a) Low total dissolved solids to reduce boiler blowdown.
- (b) Low hardness to avoid sludge in the boiler.
- (c) Low bicarbonate (HCO₃), when corrosion by condensed steam is to be expected.
- (d) Low alumina and silica where necessary (principally boilers at above 1000 p.s.i.).
- Or (2) Softening in the boiler for shell type and intermediate pressure water tube boilers which are not working at high steaming rates. Control of sludge mobility by adjustment of feedwater composition.
- (3) Conditioning Treatment.
 - (a) Addition of sodium carbonate to prevent scaling in boilers working at pressure below 200 p.s.i. Hardness

Table 2

| (Maximum | SiO ₂ | p.p.n | n. in | boiler water | to give | 0.02 p.p.m. | SiO, | in steam) | |
|----------------------|------------------|-------|-------|--------------|---------|-------------|-------|-----------|-------|
| Boiler press. p.s.i. | gauge | | 500 | 1,000 | 1,200 | 1,400 | 1,600 | 1,800 | 2,000 |
| Boiler water pH 10 . | | *** | 11 | 6 | 4 | 2.5 | 2 | 1 | 0.8 |
| 11 . | *** | *** | 19 | 11 | 7 | 5 | 3 | 2 | 1 |
| 12 . | *** | | 33 | 20 | 13 | 8 | 6 | 4 | 3 |

of filtered boiler water tested Wanklyn foam test should be nil (or less than 8 p.p.m. by E.D.T.A. test). Some methods of water softening leave enough sodium carbonate in the treated water.

(b) Addition of phosphatesfor scale prevention in boilers at pressures above 200 p.s.i., or in low-pressure boilers if the silica content of the feedwater is above about 10 p.p.m. Na₃PO₄ and in boiler water 75-100 p.p.m.

(c) To prevent corrosion in feed lines, and boilers working at pressures up to 200 p.s.i. the feedwater should be alkaline to phenolphthalein and the total alkalinity of the boiler water should be 15-20% of its total dissolved solids content. This alkali is present in some softened waters.

(d) To prevent corrosion above 200 p.s.i. the feedwater should have a pH value 9 and the boiler water a caustic alkalinity of about 10% of the T.D.S. content. The feedwater must be deærated to reduce oxvgen to less than 0.01 p.p.m. and it it is often advisable to supplement this with chemical deæration using sodium sulphite or hydrazine.

(e) Addition of sodium sulphate, sodium nitrate or acid phosphate to guard against caustic embrittle-ment in boilers fitted with riveted drums.

(4) Controlled continuous blowdown to maintain the T.D.S. and SiO₂ content of the boiler water in the ranges suggested (Tables 1 and 2). Intermittent blowdown to control the amount of sludge in the boiler.

(5) Special addition of sodium sulphite or hydrazine to protect idle boilers against corrosion.

(6) The institution of a schedule of regular sampling and testing to observe and control the treatment at all stages.12

The author would like to thank the Directors of the Alkali Division of Messrs. Imperial Chemical Industries Ltd. for permission to publish this paper.

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Nater Treatment

Plant and Services

Ionomatic water treatment

The Pulsometer Engineering Co. was reputedly the first to introduce into the U.K. a method of treating water too highly polluted and turbid for treatment by normal methods. This method uses specially activated silica in conjunction with other chemicals.

When clarifying water by the alum method, advantage is taken of the fact that raw water containing colloidal matter, which causes froth and slime, carries an electrical charge. A solution of alumina ferric added to this causes positively charged colloidal particles of aluminium hydroxide to be formed. These attract the negatively charged inpurities in the water, resulting in electrically neutral particles which coalesce to form an alum floc mass.

After being dosed with alumina ferric, water is treated with a sodium silicate solution before it enters the settling tank to produce activated silica with a negative charge which unites with the organic impurities and the positively charged alum, so adding to the weight of the floc and speeding up the rate of settlement. Compared with the usual water purification process, say Pulsometer, this method economises in space and size of plant.

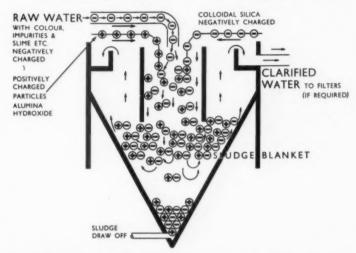
Before filtration the raw water is pumped into a dosing channel and then into concentric reaction chambers, there to be gently agitated. The resulting floc falls to the bottom of the cone and is drawn off as sludge. The clarified water is fed by gravity to the filters and when necessary drawn off by the filtered water booster pumps.

Pulsometer also supply a number of other plants and processes for water treatment, including ion exchange, and the diatomaccous filter method.

Clarification, purification and deionisation

The John Thompson-Kennicott Co. produce plants for adding coagulants to the water so that the suspended matter is flocculated and the bulk sediment settles out in the sedimentation tank. Final clarification is achieved by either pressure or gravity filters and a clean water of low haze is produced.

The same plant can frequently be used for water softening. The softening reagents, such as lime and soda ash, are added to the raw water by



The Pulsometer Ionomatic water treatment process which can be used to treat supplies too highly polluted and turbid for other methods.

the Kennicott chemical proportioning gear. If a water of zero hardness is required this is produced by the base exchange process of softening which can deal with the clean water in its raw state, that is without lime and soda pre-treatment, or the base exchange softener can be added to the lime and soda softening process.

These softened waters still contain soluble salts such as sodium sulphate and sodium chloride and the company design and manufacture deionisation plants which free the water from all soluble salts so that it has a conductivity of less than 1.

Demineralising plant

The Permutit Co. Ltd. produce a complete range of water treatment plant for the pharmaceutical and fine chemical industries and also a complete range of ion-exchange materials.

Predominant among this equipment is the *Deminrolit* ion-exchange water demineralising plant which can, it is stated, produce water comparable in quality to single or triple distillate. Practically any volume of water can be treated, ranging from small portable units to static plants of manual and fully automatic control. The *Deminrolit* is claimed to be the world's first water demineralising plant, and since its introduction in 1937 has been continually developed.

Permutit also design and construct water treatment plants for clarification and purification of water, and a range of water quality testing instruments including conductivity testers and automatic hardness testers.

At their chemical works in South Wales, they manufacture a complete range of ion-exchange materials for full-scale plant and also special grades for chromatography and analytical purposes.

Deionisation and filtration

The Paterson Engineering Co. Ltd. advise and provide means for improving water for the pharmaceutical industry. Their experience includes adjustment of pH value, reduction of colour and organic matter, removal of colloidal and suspended solids, iron and manganese removal, sterilisation, dechlorination and reduction of dissolved solids, and softening.

The Paterson Solobed deionisation unit is designed to remove all soluble salts, producing water equal or superior in quality to distilled water. It will produce a water having a conductivity of between 0.5 and 1 micro-mho per centimetre. The plant consists of a perspex cylinder containing special synthetic resins which will remove the metals and radicals from the salts present in the water. These exchanges will continue until the resins

are exhausted. Regeneration after the two components have been separated by a backwashing is by means of dilute solutions of caustic soda and HCl. After regeneration the resins are again intimately mixed by compressed air. By this means water superior to distilled water can be obtained without using the somewhat extravagant process of traditional distillation, since the modern ion-exchange resins can be reactivated many hundreds of times without loss of capacity.

The Paterson carbon filter, which in basic design is very similar to the well-known pressure filter used in potable and industrial water treatment, can be employed for the removal of small amounts of colour and also for dechlorination of supplies. It provides a final polish to the water and the only attention needed is an occasional backwashing.

In the case of waters having a very high colour or containing excessive organic matter, the company can provide equipment suitable for flocculation, coagulation and pressure or rapid gravity filtration.

For process control the Paterson Engineering Co. Ltd. supply a complete range of testing equipment for pH value, free and combined chlorine, hardness, alkalinity, chlorides, colour and turbidity.

Regeneration of deionising resins

The removal of ionic impurities in water by adsorption on mixed cation and anion exchange resins is a method which is widely used in large-scale processes. However, strongly basic type 1 resins tend to coalesce when mixed with strongly acidic resins containing sulphonic acid groups, and while type 2 resins exhibit this property to a markedly lesser extent the quality of the effluent produced by them is inferior to that made with type 1 resins. As a result of this tendency, mixed bed laboratory deionisers have been based in the past upon exchangeable cartridges which could be replaced on exhaustion.

The Griffin-Raleigh water deioniser supplied by Griffin and George Ltd. makes use of a new process enabling the resins to be mixed and reclassified in columns down to 3 in. in diam., thus making it a simple matter to regenerate the resins in situ.

The cost of pure water made with this apparatus is quoted at 12s. 6d. per 1,000 gal. when used on London mains supply. A built-in amplifier and a bridge circuit incorporating a conductivity cell enables effluent quality to be monitored and the circuit is independent of mains voltage and temperature fluctuations.

The deioniser is supplied ready for use in two sizes giving 16 and 64 gal. of very pure water per regeneration respectively, and the price of these units is claimed to compare favourably with that of the older replaceable cartridge types. Using mains water, flow rates of 5 and 20 gal./hr. may be employed with an effluent conductivity of 0·2 micro-mho. Using as influent either single distilled or two-bed deionised water, the effluent conductivity may approach 0·05 micro-mho and an inter-regeneration capacity of several thousand gal. is realised.

Ultra-violet sterilisation

U.V. sterilisation of water offers advantage where chlorine treatment is precluded for any technical reason or has to be removed for a process water. U.V. sterilisers are found useful for treating waters which have been chemically softened, for example by the new demineralising resins.

The Hanovia model 4 and semiautomatic model 5 water sterilisers developed by the Hanovia Lamps Division of Engelhard Industries Ltd. consist essentially of a 1,100 watt arc-tube in quartz, a quartz jacket surrounding the source, a reactive transformer, and electrical control gear and valve for automatic control.

Highly contaminated clear water may be treated at flow rates up to 2,500 gal./hr. with these compact units. Cost of treatment, including replacement arc-tubes, works out at around 2½d. per 1,000 gal. water.

Reference to the unit is made in a Test Report No. 54C/2 issued in 1954 by the National Institute for Research in Dairying, Shinfield, Reading.

In the *new dual-purpose water* steriliser model 6 the quartz lamp and sleeve assembly can be used as an immersion steriliser or when surrounded

by the glass Q.V.F. outer jacket as a continual flow unit.

General uses include drinking, rinsing, or process water:—From roof interceptor tanks in factories; from chemical softening plants where residual chlorine is eliminated; in naval and merchant ships, or on railways; at mines, farms, on oil prospecting or building sites; in hospitals; from wells in rural and remote districts.

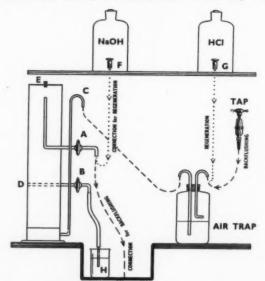
Depending upon the "optical density" of the water to U.V. the continual flow rate should be 100-400 gal./hr. For static tanks of e.g. 50-100 gal. capacity, the immersion unit will deal normally with a demand of 300-400 gal./day.

Recently a model 6 water steriliser was introduced to operate from a 24 volt battery supply.

Automatic stills

Automatic water stills are made by Manesty Machines with outputs ranging from 2 pints to 50 gal./hr. A wall mounting bracket allows the still to be placed in the position where it will be most useful, besides saving floor space. All Manesty stills are automatic in operation. Provided there are constant supplies of raw water and heat, the stills will function for 24 hr. per day, if required. They operate in the following manner:

The inlet water enters at the lower end of the condenser, circulates round the stainless condenser tube, and fills the boiling chamber to a height controlled by the new type weir. The condensing steam pre-heats the water almost to boiling-point before it enters the boiling chamber, and the still is



The Griffin - Raleigh water deioniser in which resins may be regenerated in situ.

- A. Water Stopcock
- B. Central Distributo
- Stopes
- C. Delanised Water Outle
- E Bubbas Channes
- F. Alkali Stopcock
 G. Acid Stopcock
- W. Masker

d signed so that dissolved gases are expelled to atmosphere. The baffling can the stills causes the vapour to change direction three times before passing into the condensing tube. This system of baffling prevents catrainment of raw water and also makes the stills particularly suitable in hard water districts or for use with natural waters which have a tendency to froth. It is also said to ensure a distilled water of high purity, which is claimed to be above the requirements of the British Pharmacopocia.

There are models heated by paraffin, gas, electricity or steam. The paraffinheated models are supplied complete with burner tubing and tank incorporating a pressure gauge or automatic safety valve. The OOB gas-heated model is fitted with a special duaflam burner, and the electrically-heated models are all fitted with immersion heaters containing an automatic cutout so that in the event of failure of the water supply the element is not

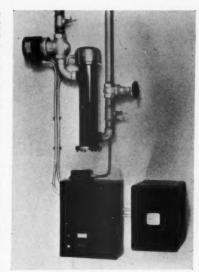
The latest development is the production of the OB and OOB stills in a vitreous and chrome finish. The lid and baffle cup are of toughened glass and the nozzle and condensing tube are made in one piece of stainless steel. A stainless steel inner baffle is also provided and a needle valve inlet tap is used on the raw water entry. The vitreous enamel covers the outside of the still and condensing pipe, etc., as well as the interior of the boiling chamber, so that, in effect, a glass-lined boiling chamber is used. The toughened glass lid and baffle cup are also used on the OOO steam-heated model, and the toughened glass lid on the No. 1B and 2B steam-heated

Water decarbonation plant

Aerox Ltd. dealt with a boiler feedwater problem as follows:

A water supply rich in sodium bicarbonate, 230 p.p.m., and calcium carbonate, 10 p.p.m. caused an excessive build-up of sodium hydroxide, necessitating frequent blowing down of boilers and consequent loss of heat.

Batches of 2,000 Imp. Gal. in a tank 11 ft. 9 in.×11 ft. 9 in.×2 ft. 9 in. liquor depth 2 ft. 6 in. were treated with 450 ml. of 77% sulphuric acid and 140 ml. of 82% phosphoric acid—material cost approximately 9d.—forming 1.05 lb. per batch of CO₂. Approximately 75% of original alkalinity was neutralised, 9.5 BDH universal colour indicator reading being obtained. Aeration was effected by taking 48 c.f.m. free air from a supply capable of a maximum pressure of 100 p.s.i., cleaning with an Aerox filter type FAL/0112/4/P35 and passing into the liquor through 47 Aerox aerators type VBR/0110/234/P32. Gauge pressure aerator supply line was 4 p.s.i. Five minutes' aeration



The Hanovia semi-automatic ultra-violet water steriliser—Model 5.



Manesty automatic water still, one of a range which will work for 24 hr. on end if required.

treatment lowered ${\rm CO_2}$ concentration to 7 BDH universal colour indicator reading. It was continued for a further 5 min. as a precaution.

Approximately £30 per week is reported to have been saved on boiler blow down costs. It is claimed that the Aerox system of aeration/diffusion ensures an intimate and even contact for as long a time as possible between gas and liquor, treatment being quicker and more efficient than when systems involving the passage of gas through tower scrubbers are employed.

Chlorinators and associated instrumentation

The Wallace and Tiernan BA-711 chlorinator features a new concept in chlorine flow control—the V-notch variable-orifice. It is said to provide wide range adjustment and excellent reproducibility of chlorine flow with substantially linear flow readings on a variable area feed rate indicator. The flow of gas is altered by adjusting the position of a grooved plug within a fixed orifice, producing a wide flow range according to the variation in area of the V-shaped orifice. The instrument is adaptable to manual or automatic operation and the addition of suitable auxiliary devices enables operation to be carried out on a programme basis. To assure long life and maintenance-free operation under rigorous conditions, the chlorinator is constructed throughout from corrosion-resistant materials. Vacuum operation safeguards personnel and equipment. In the event of a leak, the vacuum control would admit air into the machine rather than allow chlorine to escape.

In modern steam generating equipment, corrosion, due to dissolved oxygen present in the feed water, causes rapid failure of boiler tubes and ancillary gear. It has, therefore, become essential to control the oxygen content to prescribed limits, and a dissolved oxygen recorder has been designed for this purpose. It is a commercial instrument and eliminates the disadvantages of measurement by chemical reagent response or oxygen "scrubbing."

Employing the amperometric method, it gives a direct linear response to changes in the oxygen content determined through variation in current flow between two electrodes. It is equipped with automatic wide range and fine control temperature compensation. In addition, inter-ference and "drift" are eliminated through the use of a "bombardment" cell. In this the constant recirculation of fine grit particles ensures that the electrode's surfaces are maintained in a clean condition, giving constant sensitivity. A saturated salt solution increases conductivity and thereby assists the accuracy of measurement and recording. The sample water itself serves the saturator and thus prevents contamination.

A built-in electrolytic calibration cell is employed to inject a known oxygen concentration into the sample water for simple calibration checks. Visual devices indicate correct sample water and salt solution flows. A completely enclosed system and the use of stainless steel and chemically, inert materials for flow lines and controls eliminate atmospheric and chemical interference. The recorder can be arranged for selected scale ranges between 0 to 1 and 0-01 p.p.m.

with scale divisions by increments of 1/100th of the full-scale deflection.

The BA-1105 universal activated silactor prepares and applies activated silica continuously and may be used with a large number of activating agents. The undiluted sodium silicate and the activating solution are pumped and metered by volumetric chemical feeders. The controls permit a wide range of adjustment.

The MA-1067 hydraulic solution feeder is designed for dispensing solutions of any water-soluble substances and can be used on a control feed basis or to synchronise with other units working automatically to a time cycle. After metering, the chemical is mixed with the injector water to form a solution which is then applied under pressure.

Water and sewage treatment dry chemicals can be fed with a positive self-cleaning action by the PA-690 dry chemical feeder. The feed rate is adjusted by a simple control knob and measured amounts of material can be delivered through the full range of normal treatment requirements.

Constant delivery by weight of chemicals is maintained by the BA-606 Merchen gravimetric feeder, where the material is carried over a sensitive scale by a continuous flexible belt. Accurate blending of a number of materials can be controlled electrically or pneumatically.

Chlorinators

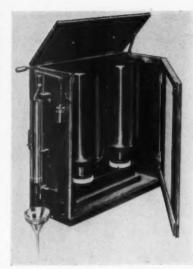
The Belco chlorinator manufactured by A. Bell and Co. Ltd. is a small, compact equipment for the sterilisation of water supplies obtained from wells, streams, rivers, etc., where there is bacteriological pollution.

The apparatus consists of a plastic cabinet with hinged top and front access door, housing amber glass solution vessels which are fitted with rubber stoppers through which is inserted a glass tube which acts both as liquid and air-tube. Inside this tube is a valve which automatically opens when the vessel is inserted into position in reverse. The discharge is by means of a drip tube which operates by syphonic action. The rate of discharge can be varied according to the output of the pumping machinery. Models of varying sizes have capacities of 100, 240, 480 and 960 fl. oz.

There are also heavy-duty models for the treatment of swimming-pools and sewage effluent. Various types of automatic operating gear are supplied, as well as the manual control.

If the installation is adjacent to a pump having an automatic control switch, on the commencement of pumping, the chlorinator automatically operates synchronously with the switching on and off of the pump.

Another type of automatic control is that in which a chlorinator is



A "Belco" chlorinator; this model has a capacity of 240 fl. oz. and has an automatic balance control.

installed over a storage tank. This is fitted with a control gear having a trough depending underneath the delivery pipe or ball-valve. The trough is carried on a rod attached to a fulerum with a counter-weight. Upon inflow into the tank, the weight of water received into the trough overbalances the control gear and lowers the drip tube to the discharge position. When flow ceases, the trough empties itself through two small leak-holes and the relief of weight restores the gear to the "off" position.

The heavy-duty models are supplied with acid-proof stoneware solution tanks and a galvanised chlorinating tank. The gear is float-controlled and the rate of discharge is variable according to the volume of water passing through the chlorinating tank.

Clarification and sterilisation

The Carlson Princess Ariston filter size VI, wall bracket model eliminates rust, dirt and other debris picked up from the water mains, and for this purpose a low grade of clarifying filter sheet is adequate. The estimated outputs through this filter are from 400 to 600 gal./hr., depending on the condition of the water and the grade of filter sheet used. The filter is manufactured in aluminium alloy, lacquered, and set with size 40 cm. filter sheets.

Where only very small outputs are required, *i.e.* 25-40 gal./hr., a Carlson 30/1 filter serves the purpose. This comprises two metal discs enclosing a single 30 cm. diam. filter sheet between copper gauzes.

Depending on the outputs required, sterilisation can be effected through

any one of the range of Carlson sheet filters, from the small Pilot Princes: to the largest 60 cm. sheet filter. They are set with "EK" sterilising filter sheets and filtration is carried out in the normal way. Basically, these filters consist of a movable chassis, a varying number of filter plates supported on runner bars, fixed and moving end castings and various cocks and connections. Outputs range from 100 gal./hr.-Pilot Princess filter, to approximately 9,000 gal./hr-60 cm. sheet filter size 1/60/50, when clarifying, and 30-2,000 gal./hr. when sterilising. Larger outputs can be achieved with filters having up to 150 plates. When sterilisation is necessary the water should first be clarified through "roughing-out" sheets before it is sterilised through the sterilising sheets, as these sheets serve basically to eliminate micro-organisms, and the most economic running is obtained, if solid visible impurities are taken out by a clarifying sheet. This process can be carried out simply by using a change-over plate which divides the filter into two. The first section is set with clarifying sheets and the second section with sterilising sheets, thus enabling the water to be clarified and sterilised in one continuous operation.

Organic chelating agents

The Detarex range of chelating agents is used in the fine chemical and pharmaceutical industries for the treatment of process water in the preparation of materials to high purity, in addition to its use as an additive to improve the shelf life of preparations by inhibiting the catalytic effect of traces of transition metal ions. These organic chelating agents are sodium salts of amino polycarboxylic acids and related compounds. The tetra-sodium salt of diaminoethane tetra-acetic acid (DETA) is an important member of the range, but the newer agents in the Detarex group of chelators ensure a breadth of properties sufficient to inactivate traces of metal ions over a wide range of pH and other variations in conditions. Iron in process water and aqueous treatment liquors can be inactivated almost throughout the entire pH range, with or without simultaneous chelation of hardness salts by one or other member of the Detarex range.

The newest member of the range, Polychelate, is said to possess great versatility and will chelate most metal ions throughout a wide range of pH conditions. It is a particularly strong chelator of iron and other transition metals in the middle of the pH range (mildly acid to moderately alkaline) and thus is valuable for the inhibition of metallic impurities in process water where products must be free from such interference. In many cases it will be

(Continued on page 289)

Perfumes for Cosmetics

I. FACE POWDERS

By V. Vasic, CH.E.

While colour and physical properties are important, the ultimate distinction of a first-class face powder rests largely on its perfume. In this practical article the author discusses the attributes a perfume should possess to make it suitable for face powders. He then gives hints on the selection of perfumes and methods of compounding them. Finally he describes procedures for incorporating them into face powders and makes suggestions for shelf-testing.

THE SELECTION of a powder perfume is of the utmost importance and must be made with careful consideration of many factors. The selection must be made by experts who are familiar not only with the face powder itself, but with various types which may be applied and with the requirements of the market.

Before the selection of a perfume consideration must be given to the odours of the raw materials. Some of the ingredients of face powder, such as tale and kaolin, have inherent odours and contain traces of impurities which will tend to offset the scent of the perfume unless it is chosen to serve a dual purpose—to mask unpleasant odours of the powder ingredients, and to function as the fragrance required for the entire compound.

Many other factors must also be considered, above all the stability of a perfume and its tendencies to cause discoloration and irritation.

The most preferable perfume is one that blends well with other perfumes without dominating them. Popular perfumes are sweet flowery types which are not heavy and possess body and elusive freshness. Perfumes with a rather indefinite bouquet are best. The odour should be light and evanescent, though well fixed

Many successful toilet water perfumes used as such or with some modification have been adopted for use in face powders. Oriental, heavy floral, aldehydic and woody notes are also being used.

Concentration of perfume

The concentration of perfume intended for use in powder has first to be considered from the point of view of price. Even where price is not a decisive factor, the amount of perfume should never be too high. A face powder should not be perfumed so that it dominates other perfumes worn at the same time.

No more than 0.5%—1% of perfume should be used in face powder. Larger amounts can cause the powder to become damp and lumpy.

Incorporation of perfume

The perfume should be incorporated after the colouring and followed by another sifting. It must be thoroughly distributed throughout the powder, and to obtain uniform distribution and avoid losses, it should be incorporated dry. This can be done by preparing a base by mixing powder perfume, either alone or diluted with a little alcohol, into an absorbent ingredient of the powder such as magnesium carbonate or precipitated chalk. The concentration of perfume in the perfume base is commonly from 10 to 20%.

After the perfume has been thoroughly mixed with the absorbent ingredient, the base is passed through a coarse wire sieve of 20 or 30 mesh. If the perfume is diluted with alcohol, the perfume base, after thorough mixing, is crushed, spread to dry in the air, and then passed through a coarse wire sieve.

The perfume base is finally sifted through a sieve of the same mesh as is used for the powder itself, put into an airtight metal container and allowed to mature for at least a week before use.

Incorporation of perfume into powder by spraying it over the whole mixture, or on to a portion of the powder, causes difficulties owing to the formation of lumps due to the excessive moisture. Much of the perfume may then be lost in sifting because the lumps are too large to pass through the mesh.

Deterioration of perfume in powder

After mixing with powder the perfume sometimes weakens or loses its odour uniformity, even after brief storage. There are many causes of perfume deterioration but most usual are: oxidation of perfume, absorption or chemical influence of powder ingredients, instability of some perfume components in the powder, and the influence of the manufacturing process.

Oxidation of perfume. Face powder consists of a great number of small, finely divided particles surrounded by large amounts of air. It has a very large surface which must be exposed to the perfume. Much greater surface distribution of the perfume may cause the oxidation of the perfume or alternatively it could become volatilised.

Absorption and chemical influence of powder ingredients. The ingredients of the powder may weaken the odour, resulting in the need for a greater concentration of perfume to maintain the pleasant scent for a longer period of time.

Face powders which contain a high amount of talcum almost invariably change the odour of the perfume compared with the type of smell that would be produced in alcohol. It is especially noticeable in the case of floral compositions and fantasy bouquets.

Zinc oxide in a moist condition develops a slightly alkaline reaction and this can have a detrimental action on perfume not stable to Iron oxides, especially when present in a high amount in the powder, such as highly coloured suntan shades, have a strong tendency to decompose the perfume.

Instability of some perfume compounds

Aldehydes are easily oxidised in the powder and essential oils rich in terpenes have a tendency to resinify. As a result of oxidation some compounds cause faint odours, others form odourless polymerisation products. Such compounds are less harmful to the powder perfume than many terpenes which under similar conditions are changed into compounds with offensive odours.

Face powder occasionally acquires a musty or sour odour if the perfume contains terpineol or patchouli oil. Resins and resinoids could also take on a musty odour after some time and cause lumpiness of powder if used in large proportions.

Influence of micropulverising

In the modern process of manufacturing face powder the ingredients are put through a micropulverising machine after a preliminary mixing in a powder mixing machine. After passing through the micro-pulveriser the mixture is perfectly homogenised in so far as colour and perfume are concerned. The violent action in the micropulveriser generates considerable heat after it has been in operation for only a short time and affects some powder perfumes sensitive to high temperatures.

The best way of preventing the loss or destruction of perfume due to this heat is to micropulverise the perfume with a small portion of the pre-mixed face powder before the machine has become hot. After the balance of the powder has been put through the micro-pulveriser, it is returned to the mixing machine together with the perfumed portion and mixed for about 20 min.

Discoloration

Some perfume ingredients may discolour face powders. Because the powder itself has already been tinted with the desired colour pigment some protection against discoloration is offered, but a colour reaction on the part of some perfume ingredients could cause a very definite change in the powder. Such discoloration can be avoided by omitting from the perfume composition the ingredients which tend

to cause changes in colour. In addition, the perfumed powder should be put through a series of shelf-tests to ensure that no discoloration occurs after a long period.

The following aromatics tend to discolour or darken, especially when exposed to light: eugenol, indole, scatole, vanillin, ethyl vanillin, musk ambrette, musk xylene, derivatives of quinoline, and methyl anthranilate (in the presence of aldehydes).

Perfume stability

Shelf-tests of the stability of perfume in a powder in its sealed container are not enough. perfume must be stable for a long period even when the box has been opened. Extensive shelf-tests are necessary to ascertain that the perfume will remain stable from the moment the box is opened until the last of the powder is applied. These tests must be carried out under exacting conditions. With any change or raw material, even in the grade of tale, additional tests should be carried out to make certain whether or not the new raw material will have any effect on the stability of the perfume. Even a change in the container to be used for packing the powder may affect the perfume, and the finished product should be put through a storage test before being adopted.

Perfume compounding

In the compounding of a powder perfume, the compounds which are easily oxidised and have a tendency to resinify or are very volatile should be avoided and replaced by their more stable and less volatile derivatives. Aldehydes and essential oils rich in terpenes must be used with discretion. Undecyl aldehyde, undecylene aldehyde and methyl nonylacetaldehyde are especially easily oxidised to the corresponding acids.

The aldehydes can be replaced by corresponding acetals. The substitution can also be effected with corresponding alcohols or their esters, such as decyl acetate, duodecyl acetate, etc., or with higher aliphatic esters of these alcohols.

Very interesting effects can be obtained with higher esters of linalool, geraniol, terpineol and citronellol, especially with linally cinnamate, linally benzoate, geranyl anthranilate, terpinyl cinnamate and terpinyl phenylacetate.

Powder perfume compositions

containing bornyl acetate, phenylacetaldehyde, bromstyrol, or lemon oil are not very stable in the powder. Compositions containing eugenol, isoeugenol, clove oil and combinations of methyl anthranilate with hydroxycitronellal are also of a low stability.

Lavender compositions for use in powders must be suitably fortified and stabilised, as without that they will lack stability in the powder.

Special attention must be given to the fixation of powder perfume. Perfume for powder should contain the highest possible proportion of solid of the fixative type, such as coumarin, musk ketone, musk ambrette, etc.

A very important factor, often neglected by powder manufacturers, is that a compounded powder perfume should be aged at least four weeks before it is incorporated into a powder.

Compounding a powder perfume is always difficult. Many cosmetic manufacturers prefer to purchase powder perfumes from renowned perfumery houses instead of compounding their own perfumes.

The following powder perfumes possess very attractive fragrance and have been found to be stable in the powder after a period of twelve months:

Base A.T. 12046, Mane Fils Bouquet 459, A. Chiris Parfum Poudre 64, Givaudan Parfum Poudre 68, Givaudan Parfum Poudre 133 bis, Givaudan Parfum Poudre 94RF, Givaudan Audacity P.2811, W. J. Bush Bouquet Powder P.1383, Lautier Fils.

Two tested formulæ for powder perfumes are given below. Both will produce first-class powder perfumes of high stability.

Powder Perfume I

| | | | | Parts |
|----------------------|----------|--------|------|-------|
| Musk ketone | *** | *** | | 2.5 |
| Benzyl benzoate | | | | 12-5 |
| Gum benzoin Sumai | tra tino | ture/I | : 10 | |
| | *** | | | 51-0 |
| *** * .* | | | | 6.0 |
| Jasmin d'Espagne, C | | ın | | 5.0 |
| Muguet Fleur No. 2 | | | | 4-0 |
| Tuberose L. G., Giv | | *** | | 3-5 |
| Sandalwood oil, Mys | | | | 3.0 |
| Rose No. 50, Givaus | dan | | | 2.8 |
| Neroli No. 24, Giva | udan | | | 2.4 |
| Vetivert oil, Bourbo | n | *** | *** | 2.0 |
| Lavender oil, Mont | Blanc | | | 0.8 |
| M - IIII | *** | *** | | 4.0 |
| Civettine/1:10/, Fi | rmenie | | | 0-3 |
| Orris concrete | *** | *** | *** | 0.2 |
| | | | | |
| | | | | 100-0 |
| | | | | |

Powder Perfume 2

| | 244.00 | | MILLE | | |
|------------------|--------|---------|---------|-------|-------|
| Copponax L.C | 3., G | ivaudai | ١ | | 22-0 |
| Jamin d'Espa | gne, | Givaud | lan | *** | 22.0 |
| Las d'Espagn | e, Gi | vaudar | | | 15.0 |
| Fougere No. 6 | 50, G | ivauda | n | | 14-0 |
| Rose Rouge, (| Givau | dan | *** | *** | 5.0 |
| Paenylacetald | ehyde | e dimet | thylace | etal | 4.0 |
| Bouvardiol Pu | re, G | ivauda | n | *** | 2.0 |
| Musk ketone | | | *** | *** | 6.0 |
| Coumarin | | *** | *** | *** | 5.0 |
| Veraroma Bei | nzoin | Siam, | Staff. | Allen | |
| and Sons | *** | | *** | *** | 4-3 |
| Ambreine, Gi | vauda | ın | *** | *** | 0.6 |
| Exaltolide / 1 : | 10/, | Firmer | nich | *** | 0-1 |
| | | | | | 100-0 |

t

n

In both formulæ mix in order named and mature one month before use.

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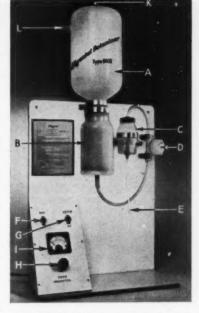
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The Elgastat laboratory deioniser type B.102 which provides conductivity water at flow rates of 15 litres/hr. Tap water enters at K, passes through mixed bed ion-exchange cartridge B, and through conductivity cell C. Effluent is drawn from outlet E and flow regulated by control valve B. The integral conductivity meter I provides a constant quality check. Mixed bed regeneration in situ being impractical on small scale all Elgastat laboratory deionisers are eligible for the Elgalite cartridge exchange service.

WATER TREATMENT PLANT AND SERVICES

(Continued from page 286)

found that an addition of polychelate or one of the other chelating agents to mains water will obviate the need to use distilled or de-ionised water.

In addition to the potential for organic chelating agents and chelates as pharmaceuticals in their own right, these water conditioning agents find many uses in pharmaceutical and cosmetic formulations where the product is to be dissolved in or diluted with water for use. In these cases, formulations can be devised with "built-in" ability to condition the water taken for the end use, thus giving the manufacturer a control he otherwise may not have without specifying the use of distilled or softened water.

In view of the wide use of steam in jacketed pans, heating coils and other equipment, as well as in steam distillation, the fine chemical and pharmaceutical industries have a strong interest in efficiency of steam raising plant, Detarex and other Deta chelating agents have a rôle in the conditioning of boiler feedwater to ensure this. If boilers are already scaled, an increased dose will achieve the descaling needed as a preliminary measure. It may be noted that the organic chelating agents are also of assistance in the descaling of enamelined jacketed equipment, heat exchangers and other equipment where

scaling problems arise and the use of acids is unsafe.

A recent addition to the *Detarex* range is *Caldorex P*, a formulated product which by combining to a large extent the advantages of *Detarex* with those of other types of water conditioner gives better performance very economically, both in boiler feed-water conditioning and in descaling.

These organic chelating agents and preparations are marketed by F. W. Berk and Co. Ltd. and manufactured by an associated company, Detarex Ltd.

Lime-free water

Plants supplied under the Lime-free Water rental scheme are industrial ion exchange units for the removal of temporary and permanent hardness from water supplies. Plant is installed to meet with any capacity as may be required by the user both in gallons between regenerations and gallons per hr.

When the softening capacity has been exhausted, the plant is regenerated with salt in brine form, this being allowed to pass slowly through the plant for approximately 45/60 min. and during this period the unit is out of circuit. When regeneration has been completed and the test again shows "zero" the plant can be put back into service in the normal manner, water from the incoming source being diverted via the softening unit under normal pressure, softened and fed back into the normal lines.

Scale inhibition

Scale formation and corrosion are the major problems created by the use of untreated water. The inconvenience of frequent cleaning and descaling is overcome by the use of Siliphos dispensed in the visual control Dosophos units. Siliphos is a slowly soluble silico-phosphate, which is manufactured in the form of green crystals; as water flows through the Dosophos apparatus small quantities of Siliphos are dissolved which stabilise the hardness-forming salts in the water so that they no longer deposit as hard scale.

Corrosion is prevented by the formation of a thin protecting film on the metal surface, the aggressive components of the water, therefore, do not come into contact with the metal of the pipes. The Dosophos unit is installed in the cold water main supply and is then charged with Siliphos crystals; the units are manufactured in various sizes depending on the required consumption of water per hour.

First British-Italian Chemical Congress

TURIN MEETING STRENGTHENS INTERNATIONAL BONDS

By The Editor

Italian and British chemists met for the first time in a joint Congress in Turin last month. The seven crowded days of discussions, industrial visits and social events forged new links between our two countries. "Manufacturing Chemist" was represented in Turin by the Editor.

IT IS one thing to pay lip service to the idea of science being international. It is quite another to take the time and trouble to demonstrate it. Full credit is due therefore to all who conceived and organised the meeting in Turin last month of Italian and British chemists, the first of its kind to be held. The occasion was the eighth National Congress of the Italian Chemical Society, a four-yearly event. It was proposed that it should be run jointly with the Society of Chemical Industry. The result was an immensely successful meeting of over one thousand members and guests of both societies, which was honoured by the patronage of H.M. the Queen and the President of the Italian Republic.

The hundred-odd British delegation was headed by some of our foremost scientists. Eleven Congress lectures were given, five by distinguished Britons and six by equally eminent Italians.

The opportunity was taken of showing the Congress some of Italy's great industries—the Montecatini paint factory and dynamite works at Avigliana, the mammoth Fiat works in Turin itself, the Farmitalia pharmaceutical factory at Settimo Torinese, and the Cinzano wine factory at Santa Vittoria

Italian hospitality was lavish. There were receptions by the City of Turin, by the President of the Province, by the Rector of the University, and by the Societa Chimica Italiana itself. There was a symphony concert and a special performance of Turandot at the Teatro Nuova. Enormous lunches were offered by the companies whose works were visited. The seven days, May 26 to June 2, were a revelation of Italian science, technology and culture, to say nothing of Italian food and wines.

The Congress was officially inaugurated on May 27 at the Teatro Carignano in the heart of Turin. The Mayor, Dr. Peyron, welcomed the delegates. He was followed by the president of the Societa Chimica Italiana, Prof. Senator Mario Cingolani. Then the president of the Society of Chemical Industry, Mr. Greville Smith, spoke and paid

tribute to the secretary of the Societa Chimica Italiana, Marotta, and his colleague Professor Ernst Chain, F.R.S., for the admirable way they had organised the Congress. (Dr. Marotta, who holds the rank of an under-secretary in the Italian Government, is the Director of the Istituto Superiore di Sanita in Rome. Prof. Chain is Director of the International Research Centre for Chemical Microbiology at the Institute.)

The Italian Government was represented at the opening by the Minister for Foreign Affairs, Prof. Pella, and the U.K. Government by the British Ambassador. These two gentlemen presented awards to distinguished members of the Congress. Honorary membership of the Societa Chimica Italiana was conferred on Sir Charles Dodds, Courtauld Professor of Biochemistry in London University. Sir Harry Melville, secretary of the D.S.I.R., and Prof. Chain. Gold medals of the Societa Chimica Italiana were presented to Sir Alexander Todd, F.R.S., Professor of Organic Chemistry, Cambridge University, Sir



Sir Robert Robinson delivering his paper Sir John Cockcroft and (right) Sir Ben on olefines.



Lockspeiser.



Dr. Lamberti-Zanardi (Farmitalia) and Prof. D. Marotta (right),



The platform at the opening of the Congress. From left to right: Mr. E. L. Streatfield (Foreign Secretary, S.C.I.), Prof. Marotta (Secretary-General, Soc. Chimica Italiana), Dr. Peyron (Mayor of Turin), Sir Ashley Clarke (British Ambassador), Mr. H. Greville Smith (President, S.C.I.), Prof. G. Pella (Italian Foreign Minister), Senator Cingolani (President, Soc. Chimica Italiana), Sir Harry Melville (Secretary, D.S.I.R.), Sir Charles Dodds (Professor of Biochemistry, University of London), Prof. Arthur Virtanen (President of the Academy of Finland, Nobel Laureate), Prof. Chain (Scientific Director, International Research Centre for Chemical Microbiology, Istituto Superiore di Sanita, Rome, Nobel Laureate), Sir William Ogg (Director, Rothamsted Experimental Station) and Sir Alexander Todd (Professor of Organic Chemistry, Cambridge, Nobel Laureate).

William Ogg, Director of Rothamsted Experimental Station, and Prof. Arturi Virtanen, president of the Finnish Academy of Science and Arts and a Nobel prizewinner.

Dynamite . . .

The first Congress lecture then followed. It was a survey of the achievements of Ascanio Sobrero, discoverer of nitroglycerine, given by Senator Michele Giua, president of the Piedmont section of the Society. It was in the Turin School of Mechanics and Applied Chemistry in 1847 that Sobrero made the discovery which was later exploited by Nobel with consequences that are now history. Congress members were later able to see the sample of the original batch of nitroglycerine which Sobrero presented to Nobel which is preserved to this day at the Montecatini dynamite works at Avigliana. Sobrero was for a time consultant to the predecessors of the present company.

. . . and nuclear power

From dynamite the Congress members' attention was switched to nuclear power by Sir John Cockcroft, F.R.S., who gave the next Congress lecture. For well over an hour Sir John spoke brilliantly and without notes, outlining the development of Calder Hall, describing the present British programme designed to give up to 6,000 megawatts of nuclear electricity by 1966, explaining the uses of radio-isotopes and finally prophesying the future of thermonuclear power following

the construction and operation of the Zeta machine at Harwell.

Sir John made several shrewd points in favour of the British gas-cooled reactor and assured his Italian audience, for instance, that there would be no difficulties in carrying out the chemical processing of fuel elements supplied to electricity undertakings abroad using British reactors. "The cost of transport to Britain from Italy would be only a small fraction of the value of the spent fuel elements," he asserted.

New polymers and fibres

At the first plenary session of the Congress Prof. Giulio Natta, director of the Milan Institute of Industrial Chemistry, spoke on stereospecific polymerisation and catalysis. The most interesting new polymers, he said, are highly crystalline polypropylene (m.p. 175°C.) and poly-1-butene (m.p. 136°-140°C.) because of the low cost of the monomers, immense quantities of which are available in petroleum cracking gases. Certain high m.w. isotactic and low crystalline stereoblock polymers consist of macromolecules containing isotactic chain sections interspersed with atactic sections or with isotactic sections of opposite steric configuration. Their properties can be varied gradually in relation to their stereoisomeric composition from those of hard, highly crystalline thermoplastics to leather-like and rubbery materials.

The low cost of polypropylene and the high yield and ease of lowpressure polymerisation make it possible to obtain directly by polymerisation a highly crystalline material which gives dry extrusion filaments. These factors make possible the commercial production of textile fibres which are likely to be cheaper than any other synthetics. They are extremely soft and possess a high thermal insulating power, yet they are much stronger than wool.

Phosphorylation

In his lecture Sir Alexander Todd described studies which have led to the development of a number of new methods for the phosphorylation of alcohols and phenols and for the related preparation of pyrophosphates and triphosphates. The scope and value of these observations in the general field of laboratory phosphorylation are being explored. Not only has the quinol phosphate work a possible bearing on the mode of action of vitamin K, but the coupling of oxidation with phosphorylation as a necessary step with quinol phosphates and enol phosphates opens up new avenues to the important problem of oxidative phosphorylation in bio-logical processes.

The next Congress lecture was given by V. Caglioti, Professor of Chemistry at Rome University, who spoke on some aspects of inorganic stereochemistry with particular emphasis on co-ordination compounds.

Tranquillisers

A review of the principal tran-

quillising drugs-phenothiazine derivatives, rauwolfia alkaloids, propanediol derivatives and diphenylmethane derivatives-was given in the first Congress lecture on Thursday by the Nobel prizewinner, Prof. Daniel Bovet. He said that in the U.S. in 1956 more than 34 million prescriptions for tranquillisers were written and in that year, for the first time, there was a decline of 7,000 in the number of psychiatric patients. French workers had reported that in a psychiatric clinic the time of hospitalisation was reduced from 122 days to 59 days after the introduction of tranquillisers.

This was eloquent evidence, said Prof. Bovet, of the possibility now presented of psychotherapeutic drugs overcoming the "spectre of our obsessions and hallucinations." The contribution of the chemists would lead to a point of meeting between pharmacology, neurophysiology and psychology.

Olefine transformations

Sir Robert Robinson, F.R.s., discussed olefine reactions of industrial importance in his paper entitled "Chemical Transformations of the Lower Olefines." He reviewed the direct epoxidation of ethylene, the formation of ethylene chlorhydrin, various syntheses of the Friedel-Crafts type, the Ziegler complex of reactions (including polyethylene and polypropylene) the "oxo" synthesis, and alkylation of saturated hydrocarbons by means of olefines (an important method of up-grading gasolines).

Labile molecular states

In his extremely interesting lecture on this subject, Prof. G. Semerano of the University of Padua pointed out that the labile species represent extremely reactive intermediate individuals capable of determining the course of quite different chemical reactions. Increased knowledge of the mechanism of molecular reactivities will achieve a better understanding of reactions initiated by high energy particles and by electromagnetic radiations of very low wavelength (radiochemical reactions) which play such a big rôle in biology, physiology and genetics because of the toxic and allergic effects, acute and chronic diseases, mutations and damage to hereditary factors, which they induce. This knowledge also has practical applications in such fields as the direct conversion of nuclear

energy into chemical energy and in processes of polymerisation, cracking, corrosion, combustion, detonation and high temperature metallurgy. The subject is important in fields as widely diverse as cancer and rocket fuels.

Fertilisers and food

The next Congress lecture on Thursday was given by Sir William Ogg. He said that the total world production of fertilisers rose from 9 million metric tons in 1939 to 21 million in 1957. British farmers are now using five times as much nitrogen, four times as much potash and more than twice as much phosphate as in 1939. In the same period food production rose by 63% and Britain is now providing about half its food requirements, compared with a third 20 years ago. In Britain over 60% of fertilisers are sold as compounds which, although more costly per unit of plant food than separate materials, are more convenient to apply. Twenty years ago British compound fertilisers contained 20% or less of plant nutrients; today many contain over 40%.

Adsorption and catalysis

In his lecture on "Adsorption, Chemisorption and Catalysis," Prof. A. G. Nasini of Turin University said that they constituted exciting and mysterious problems. In catalysis, he pointed out, the surface plays a fundamental rôle and the reacting molecular species lying on it are in contact and undergo

a transformation into the products of reaction by energy exchanges. All this happens in a very short time. Following a detailed review of work in his laboratory on these problems, Prof. Nasini announced that he and his colleagues had obtained a new class of stereopolymers, namely crystalline polypropylidene and poly-butylidene.

The final Congress lecture, on water utilisation and conservation, by Mr. Leslie Streatfield, is summarised elsewhere in this issue as part of our review of water in the chemical industry.

Technical sessions

The 500 papers presented at the Congress were arranged in more than 27 sections, namely: analytical chemistry, pharmaceuticals, physical chemistry, general chemistry, inorganic chemistry, dyestuffs, nuclear energy, organic chemistry, therapeutics, toxicology, electrochemistry and photochemistry, radioactive substances, agriculture, food, biological chemistry, fermentation, fats, cellulose and paper, cement, ceramics and glass, fuels, leather, varnishes, plastics and fibres, metals, parasiticides, disinfectants, explosives, essential oils and perfumes, sugar and technological chemistry.

Montecatini

The first factory visits were made on Wednesday, May 28, to Avigliana, a few miles from Turin. There in adjoining factories Montecatini make the Duco range of paints



About 1,000 guests sat down for lunch as guests of Montecatini, after visiting the paint and dynamite factories at Avigliana. Here is part of the scene under the huge luncheon marquee.

and varnishes and a wide range of dynamite explosives for mining and blasting.

The paint enterprise Paint. developed after the first World War as a result of capacity for nitrocellulose manufacture becoming surplus to explosives requirements. Production of nitrocellulose surface coatings started in 1928 and a few years later, again under licence from du Pont, the manufacture of glycerophthalate resins and paints based upon them was commenced. The factory became independent of the Nobel concern a few years later and in 1943 became part of the Montecatini group.

The factory, which is located in the beautiful valley between the river Dora and Lake Avigliana, now employs several hundred workers. Almost 1,000 raw materials are in regular use to produce a range of coatings based on no fewer than 2,000 formulæ. The plant area occupies 80,000 square metres.

Today the latest polyester paints



Part of the antibiotics fermentation plant at Farmitalia's huge factory at Settimo Torinese.



In one of the dynamite mixing grottoes at Montecatini, Sir Alexander Todd and Prof. E. Chain (second and third from left) listen to an explanation of the process.

and emulsion finishes are made in this well-planned and well-equipped factory, notable for its horizontal lay-out which greatly facilitates operations.

Dynamite. The dynamite works would make Sobrero marvel at the modern exploitation of his discovery. All operations are conducted underground in concrete "grottoes" to minimise the effects of accidental explosions. Once mishaps were frequent, but today remote control apparatus, including television, has

made the work almost as safe as any factory routine. Glycerin is continuously nitrated and washed with water containing alkali. It is then emulsified to make it safer for handling and pumped through conducting rubber pipes to 300 gal. vessels some distance away, where the emulsion is left to separate. The resulting nitroglycerine is filtered through wool and poured into gutta percha jugs.

The mixing of nitroglycerin with fillers to make dynamite is done entirely under the remote supervision of an operative who sits in a control room equipped with four television screens. He can switch easily from one mixing grotto to another; microphones enable him to listen as well as watch. After about 25 min. mixing the vessels are emptied by hand. The dynamite is then transferred to another series of grottoes where it is extruded into wax-paper tubes. This is again done by remote control, but in this case a simple system of reflecting mirrors is used, the whole job being supervised by a girl.

At Avigliana the use of television for remote control was pioneered by Montecatini, who take pride in the way they have safeguarded the lives of their 500 workers there.

Farmitalia

Of more general interest to chemists was the visit to the Farmitalia factory at Settimo Torinese in which is produced pharmaceuticals and intermediates. The factory covers 1,600,000 sq. ft. and employs 1,200 of the total labour force of the group which numbers 3,000. The visitors were received by Dr. Lamberti-Zanardi, the managing director, who explained how the factory had grown in the 50 years since its foundation.

Everywhere there is evidence of a high standard of chemical engineering, production control and housekeeping. Paint is used liberally to create an atmosphere of cleanliness and order.

Among the notable installations at Settimo Torinese are plants for the manufacture of chloramphenicol, a range of penicillins, streptomycin, chlortetracycline and the most recent anti-TB drug, cycloserine. Other modern drugs made there are vitamin B₁₂ (enough is made both to cover Italy's needs and to export), p-amino salicylic acid and a number of other salicylates, sulphonamides (pyridine, thiazole, guanidine and pyrimidine as well as the typoglycæmics tolbutam-





The Farmitalia factory in Milan, built in 1952. It extends over 70,000 sq. metres. Final processing pharmaceuticals is carried out here.

Plant for the

manufacture of

guaiacol and its

derivatives (for

vanillin produc-

tion, etc.) at

Tori-

Settimo

nese.

cars. Fiat is an organisation of which any country could be proud and the visit made a vivid impression on everyone.

Cinzano

For their final visit Congress members were able to see at first hand the production of some of the wines they had sampled during the week. This was at the famous Cinzano factory at Santa Vittoria d'Alba, where four principal wines are made: semi-dry, dry, extra-dry and finally the well-known sparkling Asti Spumanti. The method of processing is natural fermentation in bottles and this, coupled with the variety of grape and the methods of cultivation, confer on these wines a delicacy and bouquet of the highest quality. In the huge cellars, which spread over many acres, several million bottles of sparkling wines are stored. From the factory an average of three trainloads of Cinzano wines are dispatched each day. Abroad Cinzano have no fewer than 19 factories and many bottling plants.

This brief glimpse of a remarkable and typically Italian industry provided an apt finale to a memorable week.

ide and carbutamide), guaiacol and its derivatives for vanillin production, etc., pyrazolones, barbiturates, glycerophosphates, and animal food additives. Among newer products are the tranquillisers such

chlorpromazine. The annual value of the output of Farmitalia at Settimo Torinese is in the region of 10,000 million lire.

as meprobomate, promazine and

Fiat is synonymous with Turin. On every road one sees Fiat cars and commercial vehicles and almost everywhere are Fiat establishments

ranging from foundries to service stations. Today Fiat employ 80,000 people in a range of operations extending from steel manufacture to the production of spare parts. Congress members were conducted over the 86-acre site of the spare parts factory, the rolling mills and foundries, the Agnelli apprentices school and finally the Mirafiori motor-car factory which extends over 370 acres. The latter tour was conducted entirely in motor coaches which were driven easily between the great production lines, from engine assembly to the final inspection and track testing of the

BOILER FEEDWATER TREATMENT

(Continued from page 282)

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Pest Control Chemicals

By D. P. Hopkins, B.SC., F.R.I.C.

Organic sulphides • Fungicides and fungitoxicity • Seed disinfection • Herbicidal effects upon soil organisms • Plant growth regulating substance • Safer phosphorus insecticides

Organic sulphides

FOUR further papers in a series from Boots' Research Department have appeared, dealing with the toxicity of organic sulphides to red spider mite eggs and larvæ.1,2,3,4 This work continues the line of development begun by chlorbenside. Some of the test substances were benzyl phenyl sulphides with one of the halogen groups replaced by other non-halogen groups; some were known halogen-substituted substances with additional nonhalogen groups introduced. Another class of these sulphides studied had one benzene ring substituted by a heterocyclic nucleus. In some cases the sulphides tested were oxidised to sulphones and sulphoxides, and these were also examined for ovicidal and larvicidal activity. general the introduction of groups other than halogen groups, either in place of a halogen group or in addition, resulted in decreased The most interesting activity. influence would seem that of the nitro-group, which led to complete de-activation and heavy de-activation in some cases but to high activity in the case of p-chlorophenyl p-nitrobenzyl sulphide. The p-cyano group in the benzyl moiety showed high activity if p-Cl or p-F was present in the phenyl moiety. Non-halogen sulphides showed little activity, but again nitro- and cyanosubstituents were associated with some activity. A number of the heterocyclic benzyl sulphides displayed high activity, but with these the introduction of a p-nitro group led to much reduction of activity. The effect of p-Cl substitution had such varying effects upon activity that no conclusions about its influence could be drawn. Sulphones

and sulphoxides also tested showed generally no activity or poor activity.

The fourth paper studied the effect of halogen introduction into the methylene bridge between the two benzene nuclei of benzyl phenyl sulphides. Although halogen substitution in other positions is associated so often with increases in activity, halogen influence in this "bridge" position produced substances without appreciable activity. It was therefore concluded, but on evidence that might be called halogen-limited, that an unsubstituted methylene group in the bridge position is essential for high activity of benzyl phenyl sulphides.

Residues

In these Reports research work on methods for determining insecticide or other residues is seldom discussed; despite the expanding importance of this kind of development, it is regarded as specialised analytical chemistry and an offstream from the main flow of pest control chemicals progress. However, an exception must be made for a U.S. paper that has advocated the use of bioassay methods for residue determinations.5 the selection of a suitable organism, the bioassay method can be swift and highly sensitive to a range of residues. Its main disadvantage is the need for co-ordinating results with those obtained by chemical methods, but data are given showing good agreement for DDT, chlordan, and parathion residues, and in some other cases of disagreement it is not impossible that the bioassay approach checks the toxicity of metabolites that can be missed by chemical analytical procedure. A useful point in favour

of developing bioassay methods is that equipment needs are small and highly trained skill is not much needed.

Fungicides

Promising results with oxine or 8-quinolinol as a fungicide have led to the theory that the mechanism of action is oxine's ability to remove heavy metals by chelation, thus causing loss of essential metallic nutrients for the fungal organism. A new paper⁶ has reported fungitoxicity tests with oxine derivatives; this work was carried out to elucidate the oxine mechanism rather than to seek derivatives that might possess greater activity. Some derivatives with well-known chelating power were found to have low fungitoxic properties, and it can reasonably be concluded that the chelating property must be associated with lipoid solubility. In the derivatives tested the major influence for fungitoxicity was the phenolic 8-hydroxyl group. The fact that copper - 8 - quinolinolate has been found to be more fungitoxic than oxine has led to some doubt about the chelation theory, but the tests with derivatives of oxine have shown that combination with copper to form water-insoluble compounds does not consistently bring toxicity or increase it. comment of much interest in the paper implies that the high cost of material is a serious handicap in developing oxine derivatives on a commercial basis.

A field-test report⁷ based on two years' testing has shown that a new organic fungicide, Cyprex or n-dodecylguanidine acetate, is effective for cherry leaf spot. In 1956 it was equalled in effectiveness only by a mixture of gylodin and ferbam, but in 1957 it was superior to all other fungicides or mixtures used. This is highly promising as 1957 proved to be a year of severity for cherry leaf spot occurrence. In addition to this evidence of effectiveness, applications of Cyprex seemed to be less associated with leaf drop or with injury to leaf colour than some other fungicides. One test showed that defoliation was 25 times less with the new fungicide than with ferbam.

Fungicidal control of wheat stem rust and wheat leaf rust was tested from 1952 to 1955; the consolidated account of these tests in Kansas has appeared only this year.8 Thir-teen fungicides were used, only two of them not being of the modern organic kind, sulphur and calcium sulphamate. Although useful control of rust was secured by several of the treatments, this was sometimes associated with reductions in yield for other effects, e.g. upon germination. Good control was given by calcium sulphamate, but side-effects upon the crop and final grain were usually evident. broad conclusion reached is that fungicides now available cannot be recommended for commercial use to prevent or control rust infection, but some might be used to protect small fields of wheat being grown. for seed.

Seed disinfection

Seed dressings to control soilborne or seed-borne fungal diseases began with liquid treatments and then passed into dust treatment methods, but there has been some revival of interest, commercially as well as experimentally, in liquid methods, especially in the United The earlier weakness of liquid treatment was the excessive wetting of seed and the need for subsequent drying, so the problem became one of achieving good distribution by low-volume liquid application to seed. The wellknown Panogen method, originating in Sweden in 1938, has attracted American and Canadian post-war interest. A new and lengthy Swedish paper, published in U.S.A., discusses the fundamental mechanism of liquid seed treatment, distribution being studied by volatile and non-volatile tracer substances. The distribution of mercury on seed is governed not only by the mixing process efficiency but also by the fungicide's vapour action; in liquid treatment a low vapour pressure of mercury—10.5 to 10.4 mm. is sufficient to produce a final distribution that is reasonably uniform. With dust treatment, higher vapour pressures are needed as the effective surface of the dust is lower than the seed surface treated by Two factors that cause poor initial distribution of fungicide in liquid treatment are high moisture contents of seed or, somewhat obviously, poor mixing. Liquid mercurials penetrate the seed skin

rapidly, diffusion stopping at the endosperm. Again this is a paper requiring study in full version; a short summary cannot cover the mass of detail and discussion.

Seeds of cucumber and squash have been promisingly treated with insecticide-fungicide mixtures to give protection against seed-corn maggot and seed-rotting fungal infections.10 Under conditions favouring these attacks upon seed, emergence was increased and often seedlings were more vigorous. For cucumber seed the best treatment appeared to be a 1:4 combination of dieldrin with either captan or thiram; with squash seed captan in some soils seemed preferable to thiram.

Weedkillers

The effects of selective herbicides on soil organisms have been investigated.11 The four herbicides studied were a-chloro-N,N-diethylacetamide, 2-chloroallyl diethyldithiocarbamate, isopropyl-N-(3-chlorophenyl) carbamate, and a 2,4-D amine salt. The normal field rates of these had no effects upon rate of nitrification or rate of carbon dioxide evolution in incubated soils, but higher rates caused lessened nitrification and increases in carbon dioxide evolution. This indicates selective effects of herbicides upon soil organisms. That is to say, upon some organisms they have a bacteriostatic effect, as shown by lessened nitrification; but this reduces competition for other organisms, or there may be some actual stimulation, and carbon dioxide evolution-always a sign of more vigorous soil organism growth—rises.

A more general discussion of the same subject has appeared in summary form12 and again the conclusion is reached that at normal rates of use selective herbicides will not have detrimental effects on soil micro-organisms or soil microbiological processes. High rates are required to cause significant effects of this kind. For most herbicides of this class the main cause for removal of residues from soils is decomposition by micro-organisms.

Though some critics indict modern herbicide sprays as interferences with natural balance, a recent paper13 has strongly advocated the use of these substances in maintaining Nature Reserves. They are likely to be more economic and more effective than the laborious

mechanical methods now mainly employed in repelling invasions by undesirable plant species, e.g. bracken, sallow bushes, etc. Control of woody plants can be highly selective because basal-bark method of application with 2,4,5-T can be given. More general applications to deal with scrub invasion may also destroy desirable natural flora or species, but after initial deterrence of scrub invasion selective application methods may be more practicable. There is a need for more research on this aspect of selective weedkiller use. for U.S. employment of herbicides in Nature Reserve land are given -in a recent year 14,000 acres were sprayed at an average cost

of \$1.64 per acre.

A sideline effect of a herbicide -FW-450 or sodium 2,3-dichloroisobutyrate—should be mentioned although the actual effect cannot be classified as a form of pest control.14 It was found that after FW-450 applications to various crops, blossoms dropped off instead of proceeding normally to form seed, and in one early case it was noted that a flower had no pollen. This has been given much further study and it is likely now that in many cases the herbicide will bring about male sterility without causing female sterility. Thus, a treated crop can be pollenised with pollen from another crop which has not been treated with FW-450, making the production of hybrid seed much easier by eliminating the laborious work of hand emasculation and hand pollenisation, work so laborious that only small quantities of hybrid seed can be initially It is uncertain yet produced. whether FW-450 will be capable of large-scale development in hybrid seed production, but should unknown difficulties hamper progress it remains possible that more effective chemical relatives of FW-450 can be synthesised. The discovery of selective synthetic herbicides had an accidental origin -their ability to display selective toxicity to plant species was observed as a side-effect in growthregulator research. Now another side-effect has been observed that can open an entirely new field in chemical control over plant growth. For this new type of plant growth regulating substance the name gametocide" has been coined; it seems a bad choice, for it suggests at first sight or sound a toxic

ubstance for controlling or detering game birds as pests.

Safer phosphorus insecticides

A paper that has come to hand during compilation of this report reveals further progress towards developing organo-P insecticides with lower mammalian toxicity.15 O,O-dimethyl 2,2,2-trichloro - 1 hydroxyethylphosphonate or Dipterex has already made an import-ant advance in this direction; its low mammalian toxicity is attributable to several possible factors, the lability of the choline esterase inhibiting complex, the rapid hydrolysis of phosphonate, and detoxification through the cleavage of the Omethyl ester linkage. The new paper reports investigations of several O,O-dialkyl a-acyloxyethyl phosphonates. Of these, one was much more selectively toxic to houseflies than others - 0,0-dimethyl 2,2,2trichloro-1-n-butyryloxethyl phosphonate, and this had as low a mammalian toxicity as malathion.

Some general reports

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A broad account of safety practices in pesticide manufacturing plants has appeared. A series of short descriptions of new pest control substances may be useful to many readers; it classifies products under their short U.S. names, and gives chemical names, development history and details about restrictions on use.17

The Ministry of Agriculture's "Approved List 1958" for crop protection products has recently appeared.\(^{18}\) Quite apart from its major purpose it is an exceedingly useful booklet with crop uses and pest targets copiously indexed, enabling the reader to ascertain names of approved British products that will deal with specific problems of control. Much cautionary information about user hazards is given when applicable. An official economic-type survey of the U.S. pesticide industry in 1957 has appeared, showing stocks left, export tonnages, and estimates of 1958 needs.19

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Analytical Chemistry

By William I. Stephen, B.SC., PH.D., A.R.I.C.

Crude drugs assayed • Antihistamines • Drugs • Antibiotics Pharmaceuticals • Fine chemicals • Essential oils • Perfume intermediates • Detergents • Fungicides • Insecticides

Crude drugs assayed

THE recent annual report of the Analytical Methods Committee of the Society for Analytical Chemistry describes the work of the Pharmaceutical Society - S.A.C. Joint Committee on the methods of assay of crude drugs.¹ There are five Panels working respectively on the chemical determination of digitalis and its preparations, on capsicum (with particular reference to capsaicin), on anthraquinone purgatives (from senna pod), on rauwolfia serpentina, and on derris and lonchocarpus (for rotenone content). The panel dealing with the determination of reserpine and related alkaloids in rauwolfia has based its work on two published methods, one of which has been The other, a proved unsound. colorimetric method, shows considerable promise and it is hoped that this method will form the

basis of a recommended procedure. Banes² has reported the results of an American collaborative study of two methods for the analysis of powdered rauwolfia. Fourteen laboratories took part in the study which resulted in a modified nitrite method being preferred to a chromatographic method because of its convenience, and reliability, and the reproducibility of results. The panel dealing with digitalis purpurea is working on the correlation (if any) of chemical and biological methods of assay; its work is still in the preliminary stages. Jensen³ in Norway has recently presented a report on the chemical and biological assay of 25 specimens of Scandinavian digitalis using paperchromatographic and fluorimetric techniques. In most cases he obtained good agreement between the results for the two types of assay, although it does appear that in certain cases inactive glycosides can appreciably affect the biological assay.

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Antihistamines

In part IV of their series on the identification of drugs, Baggesgaard-Rasmussen, Berger and Folting4 have studied the behaviour of the picrates of 20 antihistamines. In every case, a well-defined picrate with characteristic melting-point is formed, either a mono- or dipicrate (but no higher picrate) being isolated. Two simple procedures are recommended for the preparation of the picrates, which give derivatives of such purity that recrystallisation if not necessary. Proof of the compositions of the picrates is given by titrations in non-aqueous media. has described crystal and colour tests for microgram amounts of 50 antihistamines.

Drugs

A new crystal test for barbiturates depends on the formation of blue to

violet crystals with an ammoniacal copper acetate reagent; the reagent is not, however, specific for these drugs although it may be useful for differentiating types of barbi-turates. Rapaport describes a method for barbituric acid derivatives based on their reaction with iodine chloride in dilute HCl, followed by addition of potassium iodate and titration of the liberated iodine. The method is suitable, for the determination of allo-, hexo- and cyclo-barbitone and thiobarbiturates, particularly in the presence of phenobarbitone and barbitone which do not react with iodine monochloride. A simple chromatographic method8 for the identification of barbiturates uses Whatman I paper and chloroformaqueous ammonia (2:1) as the mobile phase in a descending technique, followed by a second separation on buffered paper (pH 8, citric acid-phosphate buffer) using chloroform as solvent. The spots are readily seen under u.v. and by spraying with alkali, as little as 10-25 µg are detected. A simple colorimetric determination of p-hydroxyephedrine is based on its reaction with Millon's reagent.9 The coloured product is measured at 500mu which can be used for its determination. Optimum conditions are pH 2 and an iron concentration of 0.05M. As little as 0.1-30 mg. of phenazone in 50 ml. can be determined without interference from aromatic amines, codeine, phenacetin and sugars. Richter¹¹ has improved the determination of p-aminobenzoic acid present with procaine in drug preparations by adding disodium hydrogen phosphate instead of sodium hydroxide before extracting the procaine with chloroform. Errors are considerably reduced at this stage and the p-aminobenzoic acid is then determined photometrically by diazotisation and coupling with thymol. The method is very sensitive; 0.0025% of the amino-acid can be determined in a 0.5% solution of procaine hydrochloride.

A new volumetric method is given¹⁸ for the determination of isoniazid. With Reinecke's salt it gives a lilac crystalline precipitate of composition [C5H4NCo NH.NH3] [Cr(CNS)4(NH3)2], slightly soluble in water, fairly soluble in alcohol and ether, and completely soluble in acetone. The determination is carried out by adding excess silver nitrate to the acetone solution of the complex followed by titration of the excess silver with thiocyanate. The method is suitable for 25-50 mg. of isoniazid. A comparison of three volumetric methods for the determination of thiacetazone. viz. the argentimetric, the iodimetric and the ferric chloride method, shows that all three methods are accurate.13 For pure samples, the iodimetric method is preferred, but tablets are best analysed by the ferric chloride method.

Antibiotics

A survey of the solubilities of antibiotics in 24 solvents has been made14 in order to assess the suitability of a particular solvent for an analytical separation; 32 salts of 18 antibiotics are discussed from the viewpoint of their separation from mixtures and formulated products. A method particularly suitable for the determination of chlortetracycline in feeding stuffs and veterinary products depends on the conversion of the antibiotic to anhydrochlortetracyline and measurement of the extinction of the solution at 445 mu.15 A blank is made by converting the antibiotic in another aliquot of solution to iso-chlortetracyline and measuring again at 445 m μ . The method is accurate, reproducible and rapid.

The identification and determination of benzathine (N: N1-dibenzylethylenediamine) in benzathine penicillin is effected by means of two specific reactions—one based on Liebermann's nitroso reaction, the other on the preparation of an iodo derivative-serving to differentiate the compound from procaine penicillin.16 The determination of streptomycin and mannosidostreptomycin in culture media and in streptomycin intermediates is effected by isolation of the antibiotic on silica gel at pH 8.3-8.5, and elution with sulphuric acid; followed by maltol or anthrone method of analysis.17

The chromatography of tetracycline antibiotics (and their epimers) requires an ascending technique on Whatman No. 1 paper moistened with a citric acid-sodium phosphate buffer (pH 3.5).18 The developing solvent is a mixture of chloroform, pyridine and nitromethane in the ratio 10:3:20. The paper is viewed under u.v. light and the spots eluted with phosphate buffer. The determination is com-pleted by bio-assay.

Pharmaceuticals

Caffeine is determined colorimetrically in the presence of amidopyrine and alkaloids by precipitation with HCl and extraction with chloroform. The residue from the extract is dissolved in 10% sulphuric acid and the caffeine is precipitated with phosphomolybdie acid, followed by colorimetric determination of the phosphorus.19 Most alkaloids do not interfere, papaverine being an exception, and if theophylline is present it must be precipitated with silver nitrate. Non-aqueous titrimetry is recommended for the determination of theophylline and aminophylline.20 The sample containing about 150 mg. of either substance is dissolved in dimethylformamide and titrated with sodium methoxide to the thymol blue end-point. The method is preferred to that of the U.S.P. (XV) and is more accurate and rapid. An improved procedure is described21 for the determination of caffeine in "caffeine-free" coffee. The caffeine is purified by chromatography on charcoal of a chloroform extract, and the product is determined colorimetrically by a modification of Richter's method (isolation as the periodide). Accurate analyses are obtained on 2-3 g. samples.

A spectrophotometric and a visual method are described for the determination of salicylic acid in aspirin.22 The method is based on the iron (III)-salicylic acid reaction, but by controlling the variables which may affect the colour and the hydrolysis of the aspirin, a precision and accuracy within $\pm 0.0005\%$ is possible. Certain aromatic amines and their derivatives can be determined colorimetrically using chloramine T.23 Phenacetin in 90% ethanol gives an intense yellow colour when boiled with 5% aqueous chloramine T, which is unaffected by the presence of aspirin, caffeine, methylcaffeine or sodium salicylate. Amidopyrine behaves similarly, but the yellow colour is not discharged by addition of strong acid, whereas that of phenacetin is. The presence of the impurities, 4 - amino - hydroxyisophthalic acid and m-aminophenol, in sodium p-aminosalicylate in 0.25% and 0.5% amounts respectively, is shown by two simple tests.²⁴ The first is detected by measuring the extinction of an ethanolic solution of the substance at 239 m μ , and the second by

diazotising an aqueous solution and making a spectrophotometric measurement at 274 m μ . Esters of nicotinic acid show a suitable polarographic reduction wave at pH 4.7 (or, if rapid analysis is possible, in alkaline solution at pH 9.7 for the methyl ester). Free nicotinic acid does not interfere and an accuracy of $\pm 2\%$ is possible.

p-Benzamidosalicylic acid is determined colorimetrically by means of its complex with iron (III) using a Pulfrich photometer (filter S53). 26 The average error is $\pm 2\%$. A chromatographic method enables as little as 0·5 μg . of salicylic acid and m-aminophenol to be determined semi-quantitatively in 200-250 μg . of p-benzamidosalicylic acid, using Whatman No. 1 paper and the solvent system pyridine, n-butanol, saturated potassium chloride, 25% aqueous ammonia in the ratio 6:6:5:3.

Fine chemicals

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Englis and Wollermann⁴⁷ have given u.v. absorption curves for vanillin in acid and alkaline media. For quantitative absorptiometric analysis, adjustment of the pH to above 9.6 (for the basic form) and below 0.5 (for the acid form) is recommended. The pK value is found to be 7.3 and solutions of vanillin at pH 10.7 are stable for over a month. Micro quantities of pentachlorophenol are determined in paper pulp by steam distillation, followed by extraction of the distillate with chloroform, and colorimetric determination of the phenol with methylene blue.28 A precision of $\pm 4\%$ is attainable. A qualitative (and semi-quantitative) procedure utilises paper chromatography and β -methyl umbelliferone as developer. Logie²⁹ makes use of anion exchange chromatography for the separation of chlorophenols from commercial 2:4:5-trichloro- and 2:4-dichlorophenol. The column is packed with DeAcidite FF in the chloride form which is then converted to the acetate form in situ. The chloro-phenols are isolated by graded elution with glacial acetic acidmethanol mixtures or by pH control using (C2H5)3N-acetic acid buffer solutions. The chlorophenols are detected and determined in the eluates by u.v. spectrophotometry.

Taylor³⁰ has examined the principles of the formal titration of amino-acids under various experi-

mental conditions with the aim of clearing up much of the confusion surrounding the use of these procedures. Under conditions simulating protein hydrolysates, and using a formalin concentration of 6-9%, a direct titration from the $p{\rm H}$ of hydrolysis to $p{\rm H}$ 8-5 gives acceptable results.

Essential oils

An easy and practical method for the determination of linalol in coriander oil is based on dehydration in the presence of a specially prepared catalyst of copper and copper oxide.31 The experiment is carried out in tetrachlorethane solution in the Derying apparatus (see Polish Pharmacopœia III). Results come within 1.26% of the theoretical, and geraniol does not interfere. The polarography of cinnamaldehyde and its determination in cinnamon bark is carried out in buffered solution (pH 3·6-4·6).32 The aldehyde is reduced in three waves $(E_{\frac{1}{2}} = -0.86v, -1.10v, and$ -1.26v) and 5% acetic acid is recommended as supporting electrolyte. Cinnamon bark is first powdered and extracted with 25% acetic acid before the polarographic examination.

The oxime method for the determination of camphor in Ho-leaf oil has recently been criticised as giving higher results than the i.r. method, because of the presence of other carbonyl compounds.³³ Holeaf oil contains linalol and camphor and its absorbance at 1743cm⁻¹ is used for its determination, the camphor content being obtained from a calibration curve, within the range 0.5-2.6% of camphor.

Perfume intermediates

Sato³⁴ has studied the polarographic reduction of musk ambrette, musk ketone and musk xylene. The first two give two-step waves at pH 2·7·10·6 in ethanol containing 0·1 vol. of 2·5 M-sodium bromide and gelatin. Under similar conditions, musk xylene gives a threestep wave. Increase in pH increases the reduction potentials, the waveheight at a given potential being proportional to the concentration for 0·1·1·0 mM-solutions at a given pH.

Wiseman³⁵ has given an account of the techniques and limitations of gas chromatography as applied to the analysis of perfumes and essential oils. Some typical chromatograms are presented and discussed.

Detergents

Triton X-100 has been determined by a u.v. spectrophotometric method. A linear relationship exists between the concentration of dilute solutions and the optical density at maximum absorption (278 m μ) which is due to the aromatic ring. Concentrations of unknown solutions can be determined to within 1% by comparison with a standard curve.

Fungicides

Small amounts of o-phenylphenol are best extracted with cyclohexane and sodium hydroxide for most samples, although a preliminary steam distillation is sometimes necessary.37 For the determination, the solution should contain 5-25 μg of the fungicide per ml. and in cyclohexane solution the absorption at 284 and 295 mu is measured; in alkali, the measurements are made at 300 and 320 m μ . A third method uses Brentamine fast red GG which gives a cherry-red colour with the sample solution; this is compared visually with standards or measured spectrophotometrically at 494 mu. The identification of the fungicide, methoxyethylmercury chloride, is effected by reacting it with concentrated hydrochloric acid to give mercuric chloride and methyl ethyl ether.38 With potassium iodide solution, a white precipitate is formed which turns yellow, then forms red mercuric iodide when strong acid is added. The mercury in the compound is determined titrimetrically.

Insecticides

Gardner³⁹ has recently reviewed the methods of analysis of several new insecticides and herbicides. The list includes DNC, CMU (N-pchlorophenyl-N: N1-dimethylurea), sodium trichloroacetate, sodium α αdichloropropionate, pentachlorophenol, DDT, BHC, aldrin, dieldrin, schradan, dimefox, methyl demeton, parathion and malathion. Critical points in the Schechter-Hornstein colorimetric method for lindane (y - hexachloro - cyclohexane) are described40 in an effort to improve the precision and accuracy. Much depends on the nature of the lubricant on ground glass joints; acetic acid being preferable to phosphoric acid. A bromimetric procedure is described for the determination of aldrin and isodrin.41 A special

bromine flask is used which enables recoveries in the range of 99.6 to 99.8 to be obtained on 80-100 mg. samples, with a precision of $\pm 0.2\%$. Isodrin gives equally satisfactory Chlorbenside spray residues are determined colorimetrically by the use of chromic acid rather than hydrogen peroxide to oxidise the sulphide to the corresponding sulphone. 42 This eliminates interference from plant waxes; and the coloured complex formed on treating the sulphone with mdinitrobenzene is not given by DDT. Recoveries are over 90%. Infra-red is used for the quantitative analysis of BHC in technical material. 43 The sample is dissolved in nitromethane and the absorption at 11.825 μ is measured. A correction for the a-isomer is made at 11.550 µ. Relative errors are not . greater than 3%. Column chromatography on silica gel and calcium sulphate is used to separate the constituents of pyrethrum extracts.44 The solvent is 15% ethyl acetate in n-hexane. " Pyrethrin I " is eluted first with a clear separation from "pyrethrin II." A rapid, routine i.r. absorptiometric method is used for the simultaneous determination of dicophane and hexachlorocyclohexane, particularly in insecticides containing high amounts of other constituents, e.g. sulphur, tale, clay.45 The absorption of a carbon disulphide extract (from 5 g.) is measured in the region 8-15.4 μ. Dicophane gives strong absorption at 9.8 μ and BHC at 14.58 u. After correcting for interference, the results show an average error of ±0.005% in single determinations.

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Industry's Publications

Michrome Stains for microscopy, biological and histochemical reagents; Edward Gurr Ltd. have published their price list for June 1958.

M & B Laboratory Bulletin. The contents of No. 2, Vol. 3, issued by May and Baker Ltd., include articles on Chemistry in the Service of Archaeology; A Simple Sublimation Apparatus; Some Historic Salts; The Liebermann Nitroso Reaction; and The Chemist in Industry.

Keebush Diaphragm Pump. Leaflet No. 301 has as its subject details of the Keebush diaphragm pump made by the Kestner Evaporator and Engineering Co. Ltd. In this pump, which is glandless, self-priming and suitable for acids and acid slurries, the body is of Keebush synthetic resin and the diaphragm and ball valves of synthetic rubber and flexible plastics.

Crop Protection Products Approval Scheme. The Ministry of Agriculture, Fisheries and Food have issued the 1958 approved list of insecticides, fungicides and weedkillers marketed in Great Britain under proprietary brand

Nitric Acid Standards. The B.S.I. has published a new edition of B.S. 975: 1957, Density-composition tables for aqueous solutions of nitric acid which was first issued in 1941. The 40 pages of tables based on the International Critical Tables give density in g/ml. of the aqueous solution, mass in grams. of HNO₃ in 100 g. of aqueous solution, and mass in grams of HNO3 in 1 litre of aqueous solution. The numerical data remain unchanged for the temperature range 10°C. to 40°C. and the density range 1.000 to 1.531. The data are set out so as to reduce to a minimum the necessity for interpolation, and to make this as simple as possible when the need arises.

The accompanying text has been revised to take account of the fact that the 1936 version of B.S. 718, "Density hydrometers," has been replaced by B.S. 718:1953, "Density and specific gravity hydrometers." Full instructions are given on the use of the tables in conjunction with these instruments, including the corrections to be applied in various circumstances with worked examples.

Copies of this Standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1. Price 12s. 6d.

BOOK REVIEWS

Disinfectants

By W. E. Finch. Chapman and Hall. 1958. Pp. 188. 30s. net.

As ITS title implies, this book is not a manual on disinfection, but a factual account of the manufacture and uses of disinfectants.

Attention is devoted mainly to those types which lend themselves to large - scale manufacture - the coal tar disinfectants, chloroxylenol formulations, hypochlorites, and the less well established quater-naries. Other disinfectants, both old and new, receive shorter mention: iodine, for example, gets eight lines and formaldehyde less than a page.

The Rideal-Walker coefficient comes in for some hard knocks. No one method of testing disinfectants can indicate their relative values under every possible condi-

This last sentence is quoted from the report of a committee of the Royal Sanitary Institute in 1906, so the thought is by no means new, and the R.-W. test will probably exist for some time yet; not, let us hope, in the form used by one manufacturer who put on his labels simply the words "Passed Rideal-Walker Test "! However, as Mr. Finch shows, the Chick-Martin coefficient gives a much more reliable guide to use-dilutions.

One of the most valuable chapters in this very readable book is that dealing with formulation methods and the principles involved. Here such matters as soap/phenol ratio, stabilisers and carriers are clearly explained.

The chapters on disinfection of surfaces, and the practice of hygiene and sanitation, include much interesting matter. It is perhaps a virtue that they rouse many queries in the reader's mind. Hospital blankets, for example, should certainly be sterilised during laundering, but is the presence of residual inhibiting substance on the dry blanket really of practical value? Again, has a reduction of the "normal skin flora" been proved a good thing? One remembers how the indiscriminate use of penicillin lozenges has often led to Candida infection. And in dealing with cold sterilisation of

Bookshop Service

All books reviewed in Manu-FACTURING CHEMIST and all other scientific or technical books may be obtained from:

> Technical Books. 308, Euston Road, London, N.W.1. Telephone: Euston 5911.

Prompt attention is given to all

surgical instruments, etc., should it not be emphasised that most disinfectants sold for this purpose have a negligible effect on spores?

The book has a useful short glossary, and author and subject index. The illustrations are not very informative, except for those showing lay-out of plant.

A mass of information has been presented in readable form and in small compass, and this volume is warmly recommended as a practical guide both to manufacturers and users of disinfectants.

L. D. GALLOWAY.

Organic Electrode Processes

By Milton J. Allen. Chapman and Hall. Pp. 174. 32s. net.

Most research chemists who are concerned primarily with the preparation of organic compounds have been attracted by the possibilities of electro-chemical methods. I recall the practical difficulties which followed an enthusiastic period spent in the laboratory on the electrolytic preparation of hydroquinone from benzene. At another period it was thought that a chlorhydrin could be prepared more con-veniently by electrolysis, but again the work was unsuccessful, although theoretically it had certain advantages, since the hypochlorous acid could be continuously regenerated and utilised in a very dilute

At another period a study was made of the preparation of glyoxylic acid by the electrolysis of oxalic acid. This was more successful, but it showed up all the inherent difficulties of the electrolytic method, such as the use of a porous diaphragm and the mechanical difficulties associated with the manipulation of a number of cells in series. If a

relatively large output is contemplated, then the supply of direct current becomes difficult, although the new silicon rectifiers may offer greater convenience and efficiency. I know of one process which produced over one ton a week of an organic compound on a pilot plant and then had to be abandoned in spite of a very cheap source of electric power. It is also unfortunate that the really useful electrolytic reactions require electrodes with a high hydrogen over-voltage and this involves the use of lead or mercury. The Kolbe electrolytic synthesis is also interesting, but seems in practice to consume large quantities of platinum.

The author of this book is an enthusiast and does not dwell on the difficulties. The style is a little unusual but very readable and the subject matter is not covered in the same way by any other publication. The first and second chapters deal with general considerations, in-strumentation and techniques. The generation and electronic control of the electrode potentials are discussed and suitable apparatus is described in detail. The remaining six chapters are concerned with the various organic oxidation, reduction and substitution reactions. The electrolytic reactions of a large number of compounds are collected together for the first time and supplemented with a full and useful list of references at the end of each

It is always easy to criticise a book of this nature. It might have been possible to distinguish more clearly between free radical and ionic mechanisms. For example, the use of the symbol R.COO: instead of the more usual symbol R·COO - for the negatively charged fatty acid ion, fails to indicate that it has a single negative charge. The equations given do not always balance either in mass or in electric charge, but this may be excused because arrows are used instead of the equals sign.

The book is interesting, well printed, reasonable in price and can be thoroughly recommended to all interested in a technique which still shows much promise.

B. DUDLEY SULLY.

PLANT AND EQUIPMENT

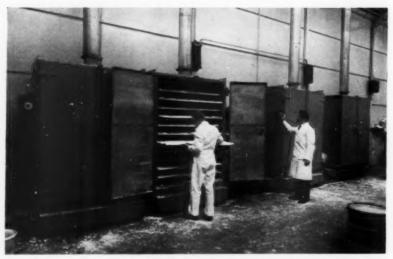
Drying Ovens for Critical Temperatures

For drying Diuromil, a granular effervescent product which acts as a diuretic and stimulant in the treatment of rheumatic complaints, Pharmax Ltd. are using eight standard drying ovens manufactured by A. E. W. Ltd. They are 6 ft. 9 in. high, 4 ft. 6 in. wide and 2 ft. deep, constructed of double sheet steel with lagging between the sides. Flame-proof elements of nickel chrome are fitted, and impeller type fans provide air circulation to ensure even heating throughout. Each oven is supplied with 11 wooden frame trays, the bottoms of which are covered with phosphor bronze woven wire gauge, again to facilitate even distribution of heat throughout the oven and therefore throughout the chemicals undergoing the drying process. Each oven is fitted with an indication temperature controller, which enables the operating temperature to be set by the operator and the oven left on with the utmost confidence that this temperature will be maintained. The temperature range of the oven is 100°C. Operating from 400 v., 3-phase 50 cc. supply, the loading for each oven is 8 kilowatts, and the finish is in heat-resisting enamel.

Porcelain Ball Mill

Doulton Industrial Porcelains Ltd., part of the Royal Doulton Group of Potteries, have introduced a range of porcelain ball mills of completely new design. Known as figure C.401, they are constructed from Doulton hard porcelain. These mills are stated to be free from corrosion and contamination and are specially recommended for wet or dry grinding of paint ingredients, pharmaceutical products and foodstuffs.

Supplied in 10 sizes from 1 pint to 7 gal. nominal capacity, they have a special ground cover and fixing arrangement and can be used with or without the petrol- and oil-resisting washer supplied. A particular feature is that covers are interchangeable without affecting the efficiency of the seal. A pouring spout, which can also be used as a strainer, is available if required.



The A.E.W. electric ovens at the Bexleyheath factory of Pharmax Ltd. Granulated constituents of Diuromil are being placed in one oven while the correct temperature is being set on another. As one of the constituents decomposes at a temperature a little above that demanded for drying, the temperature is thermostatically controlled within narrow limits.

Fluid Grinding Mills

Kek Limited have pointed out that the fluid grinding process referred to by D. P. Hopkins in his article on Pest Control Chemicals in our April issue (p. 157) is carried out with the Wheeler-Stephanoff Fluid Energy Mill for which they are the manufacturing agents in this country, Europe and Australasia. The underlying principle of all jet action fluid mills is that when two objects collide with sufficient force, one or both of them break into smaller pieces. The material to be pulverised is exposed to streams of fluid in the mill. This fluid, usually air or steam, is introduced through specially designed nozzles which convert the fluid energy into velocity. solid particles are swept into violent turbulence by these sonic or supersonic velocity streams, colliding with and quickly pulverising one

In the "Jet-o-mizer" the grinding chamber is of an inverted trapezoidal cross-section which forces the circulating material to concentrate near the nozzles, loading the fluid streams more effectively. Grinding efficiency is markedly improved by this modification of the more usual circular

cross-section, and a sharp decrease in mill wear results from the consequent reduction in wall impingement.

The next step is to separate the pulverised material from the oversize particles. Attempts to perform this separation in the reduction zone have been only partially successful. The "Jet-o-mizer" grinds in a zone designed for grinding, and classifies in a zone designed for classifying.

The fluid stream leaving the reduction zone of the mill flows through an "upstack" to the classifier whose walls are shaped to a logarithmic, anti-friction curve. As the stream enters this zone, its velocity is adjusted to combine with centrifugal action in guiding the larger particles away from the mill outlet. Part of the circulating fluid, as it passes the reverse outlet, is deflected and swept from the mill.

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With this sudden reversal of flow only the solid particles that are small enough to be diverted from their path by the viscous drag of the fluid, leave the mill. Oversize particles, remaining in the mill, are carried back into the reduction zone, joining raw feed as it is introduced by an injector. Stoppering Under Vacuum

A device for automatically setting the stoppers into the bottles or ials in which material has been freeze-dried, while they are still within the vacuum chamber—to prevent contamination once vacuum s broken—has been developed by F. J. Stokes Corporation, Philadelphia, and is now available in their freeze-dryers.

The device consists of a thin steel pressure plate, suspended under each shelf, and operated by differential pneumatic pressure. The stoppers are held above the necks of their respective bottles in special holders, permitting drying to proceed unobstructed. There are no additional openings in the vacuum chamber, and therefore no mechanical seals to maintain against leakage. The bottles are closed while still under the original processing vacuum, which avoids contamination Bottles of different heights and shapes can be processed simultaneously on different shelves. Any number of bottles or vials on one shelf—from a partial load to a full load—can be closed automatically without adjustments.

No time-consuming and delicate adjustment of the length of travel of the pressure plate is required, in contrast with ram-actuated plates.

High-speed Overprinter

Dapag (1948) Ltd. have added to their range of rotary overprinting-machines the high-speed Tickopres VM. Its speed of 150 r.p.m. enables it to treble the speed of its predecessor the Tickopres Imprima by being able to make 6,000 impressions an hour. Consuming only about 17 watts, it is powered by a 240-volt A.C. motor, though the manufacturers state that motors of various specifications can be fitted. The operator has both hands free for feeding.

Accurate registration at full speed is claimed upon such varied surfaces as card, paper, linen, film and metal. The machine will print upon almost every kind of labelling item used by manufacturing chemists and druggists—including bottle-labels, strung tickets, pin tickets and metal tags—and upon small bags and collapsible containers within the size limits of 1½ in. square and 6½ in. × 5½ in.

Standard type faces, in sizes from 8 to 18 point, are used. Plates or stereos are used for brand-names, special arrangements of rules, etc.



A stage in the Stokes vacuum stoppering process. Drying is complete and the pressure plate has driven stoppers into the necks of the bottles without breaking the vacuum.

The type, disposed in trays by alphabetical and numerical order, is set by being slid into a composing-stick and thence into channels on the type drum. Guide prongs ensure a smooth transfer. Interchangeable type drums and slugs allow often repeated detail to remain permanently set up. Any combination of type likely to be required again can be stored in a self-locking "Tickoline" key.

Extraction by Partition Chromatography

Separation of dilute solutions of complex materials, often of natural origin, by means of partition chromatography has become increasingly important in organic analytical techniques.

To overcome some of the limitations of this method—in particular the small amount of product normally obtained and the common difficulty of separating the pure

material from the adsorbent-a multi-stage liquid/liquid extractor has been developed in the United States. In this, the materials to be separated divide between two immiscible solvents. This extractor will give much larger amounts of product in a form from which they can be analysed directly by standard methods. Thus counter-current liquid/liquid extraction is an excellent tool for the separation of naturally occurring compounds (often salts) or other non-volatile or heat-sensitive solutions. Apart from its application to general analytical problems the method is of especial value in the fields of natural products (of both plant and animal origin), antibiotics and pharmaceuticals, for the separation of materials which are extremely difficult to handle in any other way.

The Quickfit liquid/liquid extraction machines are automatic and semi-automatic types carrying up to 200 tubes of 25 ml. phase capacity.

Each tube is separate and interchangeable. Thus the glassware may readily be dismantled and cleaned, breakage and replacement costs being reduced to a maximum. There is a stopper so that, if required, sampling of both phases can be carried out in every tube. If necessary the tubes can be closed with a plastic cap and/or cotton wool.

An automatic pick-up provides continuous feeding of the light phase. By a simple adjustment, this phase may be re-cycled through the entire bank of tubes as many times as is desirable. The machine runs automatically for upwards of 75% of the time.

The new "Tickopres VM," an electric overprinter producing 6,000 labels, tickets, tags, etc., per hour.



News...

"C.R.L. facilities should be enlarged"

CHEMISTRY BOARD URGES BIG EXPANSION IN INORGANIC RESEARCH

An expansion of the work of the Chemical Research Laboratory, Teddington, is recommended by the Chemistry Research Board in its latest report. They say that plans for the next five years (1959-64) should provide for more buildings, equipment and staff. The programme for inorganic chemistry research, particularly on high purity materials, should be the focal point of future expansion but greater effort is urged in other fields, for example on chelating and on high polymers and microbiology.

A new venture has been the establishment at Harwell of a C.R.L. unit to study the uses of radioachemicals. Work on the extraction of radioactive elements from minerals and ores is to be extended by the U.K. Atomic

Energy Authority.

The report of the director of the C.R.L., Dr. D. D. Pratt, highlights the

year's work, for example:

Corrosion. Three water circulating systems have been built to study corrosion of tubes in water-circulating cooling systems. Knowledge gained from the fundamental studies of corrosion inhibitors will be applied to testing the effectiveness of introducing soluble inhibitors into circulating systems.

Inorganic Group. Using large ionexchange columns, most of the rareearths have now been isolated with purities of 99-9%. In addition, large quantities of concentrates have been built up. A chromatographic technique has been developed for concentrating the less plentiful constituents. Zone refining has been studied as a means of producing the highly pure elements now required by the electrical industry; in some cases (e.g. tellurium, indium, tin and antimony) the method is not effective in removing all the impurities and prior chemical treatment is necessary.

Radiochemicals. Advances have been made with resin-in-pulp and solvent-extraction processes for the extraction and recovery of uranium and thorium from ores; an ion-exchange phosphorylated cellulose has been developed for the recovery of thorium. A field method which can be carried out by relatively unskilled personnel, and which should prove of great value in geochemical prospecting, has been developed for the determination of as little as one part of uranium in 1,000 million parts of river water.

Organic Group. Measurements of

the fundamental thermodynamic properties of highly purified specimens of compounds of scientific and industrial importance will be made more complete by the work at present being initiated on the direct measurement of specific heats and latent heats of vaporisation. The increased effort on truly selective ion-exchange resins has permitted several new sources of chelating and complexing resins to be examined.

High Polymers. With the support of the National Research Development Corporation, the work on ion-selective membranes has been intensified. Encouraging progress is being made in the preparation of new types of these materials, which are of considerable importance in dialytic and electro-

dialytic processes.

Sulphur. The pilot-plant trials of the microbial production of sulphur from sulphate-enriched sewage sludge being carried out by the London County Council at their Northern Outfall Works at Beckton, have confirmed earlier laboratory experiments in that the final sludge "de-waters" more efficiently than sludge digested for methane. This means that the volume of solids for disposal is greatly reduced, thus effecting a considerable saving in transport costs. This fact may have an important influence on the economics of the process. Trials have provided essential information for the design of larger semi-scale plant.

B.A.'s Glasgow meeting

The 120th annual meeting of the British Association will be held in Glasgow from August 27 to September 3, 1958. The President this year is Sir Alexander Fleck, F.R.S., chairman of I.C.I., and he has chosen the title "Science and Business—a Balanced Partnership" for his Presidential Address, which will be delivered in St. Andrew's Hall, Glasgow.

The President of Section B—Chemistry, is Prof. H. J. Emeleus, F.R.s., Professor of Inorganic Chemistry at Cambridge. His Presidential Address will be on the Chemistry of the Transuranic Elements. Other topics to be discussed in section B include silicone polymers, phosphonitrile compounds, crystallography, metallurgy and organic fluorine compounds.

Full details of the meeting can be obtained from the Secretary of the B.A., at Burlington House, London,

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Weedkillers; a warning

At a recent meeting of the British Weed Control Council information on the aerial application of hormone weedkillers such as 2,4-D and MCPA and on the use of sodium arsenite for weed control came under discussion. It has been known for some time that the spraying of hormone weedkillers from ground crop spraying machines, valuable as the technique is on agricultural crops, can constitute a hazard when sprayed near susceptible crops such as tomatoes, cruciferous crops (turnip, swede, cabbage, cauliflower, kale, brussels sprouts, etc.), beet, orchard trees at flowering time (especially pears), lettuce and glasshouse crops, because of the danger of drift; for example, tainting of tomatoes with MCPA and malformation of lettuce with MCPA or 2,4-D. This hazard is greatest when low-volume spraying is practised. The dangers of applying these chemicals from aircraft, and particularly fixed wing aircraft using atomisers, are immensely greater, for in the small fields of this country it is practically impossible to ensure that all the spray reaches the target area. The Council feels strongly that it should be widely known that aircraft spraying of hormone weedkillers near such susceptible crops is dangerous and should be avoided.

Sodium arsenite is an efficient weedkiller and is recommended for weed control in bulbs and for potato haulm destruction, but, because of its highly poisonous nature, it should under no circumstances be used in other crops. It is known, for instance, that where sodium arsenite has been used for the control of weeds in other crops such as kale, arsenic residues that may be left on and in such crops are dangerous.

K.I.D. exemptions

The Treasury have made an Order under Section 10(5) of the Finance Act, 1926, exempting the following chemicals from Key Industry Duty until August 18, 1958:

Acrylic acid Beryllium sulphate 2-Chlorotoluene Ergosterol Glutamic acid 1-Phenylsemicarbazide Potassium xanthate Sorbic acid Trimethylene chlorobromide

Company finance

Cussons, Sons and Co. Ltd. Consolidated profit for 1957 totalled £300,725 (£280,343).

Beecham Group Ltd. Group net profit for the year ended March 31, 1958, reached £2,516,397 (£1,867,142).

Borax (Holdings) Ltd. For the half year to March 31, trading profits amounted to £578,957 against £1,987,178 for the first six months of the previous year.

(O, for atom plant

The Chemical Division of the Distilers Co. Ltd., which provided the Lquid carbon dioxide bulk storage and evaporation equipment for the first commercial atomic power station at Calder Hall, has been responsible for the installation in the new station

at Chapel Cross.

The complete installation designed by the company includes five thermally insulated bulk storage tanks, each with a capacity of 20 tons of liquid carbon dioxide and with a pressure-operated refrigerator and safety valves, together with six evaporators, each capable of vaporising 3 tons of liquid carbon dioxide per hr. The storage tanks were fabricated by John Thompson Ltd., insulation was carried out by Dick's Asbestos and Insulating Co. Ltd., the stop valves were supplied by Newman Hender Ltd., and the safety valves and evaporators were designed and made by the D.C.L. Engineering Development Section.

New Venesta development

Venesta's new foil division has been formed to meet increasing demands for aluminium foil which rose from 4,500 tons in 1946 to more than 21,000 tons last year when Venesta's first move to increase production was made.

They installed four new rolling mills at Silvertown and at the same time acquired the Acme Tea Chest Co. of Glasgow with its subsidiary the Empire Aluminium Co. The latter factory, together with the Silvertown factory, forms the new division. It is claimed to produce 40% of all foil in Britain.

Kekulé symposium

A Symposium on Theoretical Organic Chemistry, arranged by the Chemical Society under the auspices of the Section of Organic Chemistry of the International Union of Pure and Applied Chemistry, will be held in London on September 15-17.

The meeting commemorates the centenary of Kekulé's celebrated paper "On the Constitution and Metamorphoses of Chemical Compounds and on the Chemical Nature of Carbon" (Annalen 1858, 106, 129), in which Kekulé developed ideas which first came to him during his stay in London.

The discussion will be arranged under three main headings, Chemical Binding and Structure, Nucleophilic Reactions, and Electrophilic and

Homolytic Reactions.

The final programme and application forms will be available at the end of June and will be sent only to those applying as soon as possible to the Secretary, Chemical Society, Burlington House, London, W.1.



AMBASSADOR VISITS LEONARD HILL STAND

The Leonard Hill stand at the Achema chemical engineering exhibition held in Frankfurt last month was honoured by a visit from the British Ambassador to Germany, Sir Christopher Steel. Here the Ambassador is seen chatting with Mr. Ernest Hill, who was in charge of the exhibit. All the Leonard Hill process engineering journals and books were on display. "Manufacturing Chemist" attracted a great deal of favourable interest and comment.

Organotin compounds, fungicides and insecticides

Compounds which he claimed would protect agricultural crops from the ravages of insects and fungus more effectively than ever before were described recently by Dr. E. S. Hedges, Director of the International Tin Research Council, at the University of Montpellier, France.

Dr. Hedges, who was addressing a gathering of representatives of the chemical industry, University professors, research workers and teaching staff on "The Scope of Organotin Compounds in Industry," described the use of certain of these compounds as fungicides and insecticides in agriculture as "the most important application of all."

Practical tests carried out in Germany, he continued, proved that one type, known as triphenyltin compounds, "are more effective than any other known substances in controlling certain fungus diseases in celery, sugar

beet and potatoes."

"Laboratory tests and practical trials carried out so far have shown great promise in a number of directions," Dr. Hedges said. Some of the objectives of research could be reached only by making new compounds more specific in their biocidal action—killing one form of life and leaving others unharmed. He concluded by saying, "I would recommend the further study of organotin chemistry both as a subject for pure

research in the Universities and for practical investigations in industrial research laboratories."

Paint technical service

A new technical service laboratory building has been erected at Slough to provide the Paints Division of I.C.I. with facilities for giving comprehensive technical service to its customers. This service includes advice on painting specifications and techniques of application, demonstrations to customers, and the training of their painting operatives. Practical trials of new products and new techniques are also carried out in this building.

Closely linked with the Technical Service Department is the Colour Advisory Department, where specialists advise on the use of colour and prepare colour schemes to suit individual customer's requirements. The new building consists of a main singlestorey laboratory block with a two-storey administration wing.

In the new laboratory all the different sections of Technical Service at Slough will be housed under one roof for the first time in the history of the

Division.

The greatly improved equipment will provide the Paints Division with what is almost certainly the most outstanding paint-service laboratory in this country, and possibly even throughout the world.

People

Dr. R. H. Dodd, M.I.CHEM.E., has been appointed managing director of Chemical Construction (Great Britain) Ltd. The retiring managing director, Mr. M. S. Henderson, will continue as director of the company for the time being. Dr. Dodd, an American, came to this country in 1945, formed the Lummus Co. of which he became the first general manager, and returned to New York in 1950. In 1957 he was appointed director of the Lummus Engineering Development Centre at Newark, New Jersey.

Her Majesty Queen Juliana of the Netherlands has appointed Mr. A. Schwarz, managing director of the Polak and Schwarz organisation, Officer of the Order of Oranje-Nassau. When last year Queen Juliana visited the Zaandam factory, which is the head office of the P. & S. concern, Mr. Schwarz conducted Her Majesty on a tour of the various departments.

Mr. Alwyn Readshaw, research chemist with Croda Ltd., will lead the production team at the new Croda Belge factory at Verviers. The factory will manufacture lanolin. Mr. Readshaw is 21 and joined Croda from school.

Mr. J. E. Clark has been appointed manager of the Midlands district for British Oxygen Gases Ltd. He succeeded Mr. J. G. Williams, who has retired after 46 years' service.

Mr. Gerard Mann has relinquished his post as industrial sales manager to James A. Jobling and Co. Ltd. and is taking up the appointment of general manager to Charles Hearson and Co. Ltd., laboratory furnishers, Bermondsey, London.

Mr. R. W. Ramsey has been appointed a director of Evans Chemicals Ltd. He has been associated with the company since 1946.

Mr. T. F. W. Jackson has been appointed chairman and managing director of Union Carbide Ltd.

Mr. F. A. Robinson, M.SC.(TECH.), LL.B., F.R.I.C. has been awarded the degree of D.SC. Manchester University for his research into vitamins and antibiotics. He is director of the Research and Control Division of Allen and Hanburys Ltd. He is treasurer and a past chairman of the Biochemical Society, director and hon. secretary of Biological and Medical Abstracts Ltd. which publishes International Abstracts of Biological Sciences, and a council member of the Royal Institute of Chemistry.



Mr. F. A. Robinson Mr. A. Talbot

OBITUARY

Mr. G. A. S. Harvey, president of G. A. Harvey and Co. (London) Ltd., died on May 28 in his 74th year. He was the son of the founder of the company and entered the business at the age of 17. He was appointed assistant managing director on the incorporation of the company in 1913 when the works were moved to the present site in Woolwich Road, and later accepted the position of managing director. On the death of his father in 1937 he was appointed chairman and managing director, a post he occupied until his retirement from active participation in the company's business in 1956 when he was appointed president.

U.S. firm's British company

Mr. Alan Talbot is managing director of a new company, Merrell-National (Laboratories) Ltd., 20 Savile Row, London, W.1, which will begin trading in the near future when the recruitment of sales executives and representatives is completed. Mr. Talbot has recently returned from a visit to the parent organisation, Wm. S. Merrell Co., in Cincinnati. Before joining Merrell-National he was with May and Baker Ltd., John Wyeth and Brother Ltd., and then E. R. Squibb and Sons Ltd.

B.P.C. amendment

The Council of the Pharmaceutical Society has authorised the following amendment to the British Pharmaceutical Codex 1954. The date on which this amendment will take effect will be announced later.

Paraffin gauze dressing (p. 927)

The bleached cloth to be impregnated with yellow soft paraffin in place of a mixture of balsam of Peru and yellow soft paraffin.

Sterilisation. Amend to: It is sterilised by maintaining at 150° for one hour, or by any other suitable process.





Mr. T. Jackson

Dr. R. H. Dodd

Pharmaceutical Society president

Mr. D. W. Hudson has been reelected President of the Pharmaceutical Society for a second year and Mr. G. H. Hughes has been re-elected Vice-President.

African agents appointed

Follsain Wycliffe Foundries have appointed three agents as follows: South Africa.

H. Incledon and Co. (South Africa)

P.O. Box 3620,

Johannesburg.

Northern Rhodesia (except Livingstone).

J. L. Curtis Ltd., P.O. Box 140,

N'dola.

Southern Rhodesia and Livingstone.

Mine-Elect (Pvt.) Ltd.,

P.O. Box 316.

Bulawayo.
The above agents will handle all
Follsain Wycliffe products consisting
of castings in blackheart malleable
iron, in CY abrasion resisting alloy,
and in heat and wear resisting alloys,
in addition to the Pulmac range of
pulverisers.

Honeywell Controls Ltd.

Honeywell-Brown has changed its name to Honeywell Controls Ltd. All head office departments and the London branch office have moved from Perivale to a new building in Ruislip Road East, Greenford, Middlesex (Waxlow 2333).

Foxboro-Yoxall's new factory

Foxboro-Yoxall have opened a new factory at Redhill, Surrey.

At the opening ceremony, some 700 employees and a large party of guests heard Mr. L. S. Yoxall, chairman and managing director of Foxboro-Yoxall Ltd., refer to plans for the utilisation of the full 58 acres of the site. He then called on Mr. Carl Sullivan, vice-president of the Foxboro Co., U.S.A., who spoke of the close and cordial relations which have existed, since the earliest days, between the English and American companies.

Boots' new research building

Towards the end of the year a 2750,000 biological research block will be completed by Boots Pure Drug Co. td. Situated in the Pennyfoot Street rea of Nottingham, the building will bring under one roof the biology division, the medical department, the medical and scientific library and various other departments. It will provide accommodation for a 100% increase in the present qualified biological staff.

Rising in L-shaped formation, there are three sections. The largest and tallest is the laboratory block, seven storeys and 80 ft. high. The smaller administrative wing contains offices, library and a lecture theatre to seat 200. Joining these at the angle of the L is a linking staircase and cloakroom, distinguished by a large single window, 60 ft. high and 24 ft. wide.

Between each of the seven storeys there is a ceiling-to-floor space of 3½ ft. which accommodates water, gas, compressed air, steam and vacuum pripes

Since the laboratory block will be air conditioned, none of its windows will open, so that window-cleaners' ladders will be suspended from a gantry rail at the top of the building.

Glass firm's South African venture

Johnsen and Jorgensen Flint Glass Ltd. have acquired a 50% holding in a subsidiary of the South African public company, Consolidated Glass. The new arrangement is designed to replace the Johannesburg firm of Laborglass, who previously supplied a proportion of South Africa's tubular glass requirements, but it was felt that greater manufacturing and distributive knowledge was required to compete successfully with Eastern Europe. As a result of the tie-up between Consolidated Glass and Johnsen and Jorgensen, a new company has been formed, named Johnsen and Jorgensen (S.A.) (Pty.) Ltd., of which the chairman is Mr. R. P. Stent—the British company nominee-and whose managing director is Mr. R. Adamson.

With the eventual aim of manipulating tubing supplied by Consolidated Glass, the Laborglass plant is to be extended. The plant is designed to produce ampoules, test tubes, penicillin vials, vaccine bottles and other pharmaceutical containers in quantity to the requirements of the British Standards Institution.

The new company will carry sufficient stocks to enable the pharmaceutical industry to cope with emergencies and epidemics. Its establishment should result in a decline of imports from Eastern European and other countries, at the same time providing valuable invisible exports in South African currency for Britain.

Front view of the research block which is being built by Boots Pure Drug Co. at Nottingham.



British Petroleum develop chemical manufacture

Consolidated net profit for 1957 of British Petroleum Co. Ltd. amounted to £52,018,461, compared with £53,014,561 in 1956.

Major expansion in the Group's activities for the manufacture of chemicals from petroleum in the United Kingdom, France and Germany took place during the year.

The three U.K. companies in which BP participates have operated satisfactorily with all manufacturing units maintaining a high output of intermediate petroleum chemicals. These companies, all at Grangemouth, are British Hydrocarbon Chemicals Ltd. (in which BP has a half interest), Forth Chemicals Ltd. and Grange Chemicals Ltd. (in both of which B.H.C. has a two-thirds interest). Plants for the production of phenol and acetone using the Distillers Company process are under construction by B.H.C. Several plants employing this process are in operation elsewhere but this is the first of its kind in the U.K. B.H.C. also have a plant under construction for the manufacture of linear polyethylene of improved physical characteristics using the newly developed Phillips low-pressure catalytic process. These units are expected to be completed in 1959 at a cost of about £8,000,000. A further expansion of ethylene production at B.H.C. is being considered.

When plants now being built are completed, the production of chemicals at Grangemouth will approach 200,000 tons p.a. and in addition to the products mentioned above, will include large tonnages of industrial alcohol, isopropyl alcohol, monomeric styrene, butadiene, propylene tetramer and detergent alkylate.

In addition to the three companies in which BP participates, Gemec Ltd., a subsidiary of Union Carbide Ltd., has recently commissioned a plant at Grangemouth to produce 12,000 tons p.a. of polyethylene using ethylene purchased from B.H.C.

French associate, Société Française des Pétroles BP, has a substantial holding in Naphtachimie whose chemical works are near Lavera refinery. The capacity of the cracking plant at Naphtachimie was enlarged during 1957 and its production of ethylene increased from 10,000 to 18,000 tons p.a. The production of polyethylene using the Ziegler low pressure process will start shortly and extensions are in hand which will include increasing the yearly ethylene production capacity to 48,000 tons. Total production of chemicals is then expected to reach 80,000 tons p.a. These include ethylene oxide and its derivatives such as glycols, ethanolamines and glycol ethers, and also acetone and isopropyl alcohol. The expansion now in hand is expected to cost £16,000,000.

A joint company (Erdölchemie G.m.b.H.) has been formed by BP's subsidiary company in Germany, BP Benzin und Petroleum A.G., and Farbenfabriken Bayer of Leverkusen to manufacture intermediate petroleum chemicals. Present plans call for an expenditure by Erdölchemie of about £25,000,000 over a period of four years and each partner will have a 50% participation. The site of the new company's operations will be adjacent to the Bayer works at Dormagen, Cologne; some production units are already under construction. About 250,000 tons p.a. of petroleum feedstock will be required by Erdölchemie and this will, in due course, be supplied from the new BP refinery to be built in the Ruhr.

New factory for Meggeson

Meggeson and Co., Ltd., manufacturing chemists, Llewellyn Street, London, are having a factory built on a site at Hatcham Road, Peckham, London.

Glaxo-Allenbury appointments

Glaxo Laboratories Ltd, and Allen & Hanburys Ltd. announce that in order to achieve a closer working arrangement between the two companies, Mr. H. W. Palmer, their managing director, has been appointed to the board of Allen & Hanburys Ltd. and Mr. C. W. Maplethorpe, managing director, Allen & Hanburys Ltd., has been appointed to the board of Glaxo. The two companies merged on May 30.

Symposium on instrumentation and computation

A symposium on "Instrumentation and Computation in Process Development and Plant Design" will be held in the Central Hall, Westminster, on May 11, 12 and 13, 1959, with subjects as follows:

Improving the efficiency of exist-

The design of new processes.

The application of on-line com-

Recent developments in instruments, on-line computers and computers for design.

(a) The use of computer techniques in large and small companies.

(b) The future (one paper only). This meeting is being organised by the Institution of Chemical Engineers, the Society of Instrument Technology and the British Computer Society.

British Cellophane move

British Cellophane Ltd. will move on July 14 to Henrietta House, 9 Henrietta Place, London, W.1. The building, which is nearing completion, will house all BCL staff at present in 12-13 Conduit Street and 20 Savile Row, W.1. London staff of Colodense Ltd. and Bonded Fibre Fabric Ltd., associated companies of BCL, will also move to this address.

Armour Chemical Industries Ltd.

Armour Chemical Industries Ltd. has taken over the business of the Chemical Division and the Armour Laboratories, hitherto part of Armour

The directors of Armour Chemical Industries Ltd. are: Mr. T. D. Lively, Mr. J. L. McCowan, Mr. M. K. Schwitzer, M.I.CHEM.E., and Mr. W. F. Ticehurst. Mr. Ticehurst continues to be in charge of the pharmaceutical side of the business. Mr. Schwitzer continues to be in charge of all industrial chemicals sold by Armour Chemical Industries Ltd.

Foam mixing equipment

Baxenden Chemical Co. Ltd., Accrington, Lancs., have been appointed sole distributors in the United Kingdom and Europe for urethane foam mixing equipment manufactured by the Newton Tool and Manufacturing Co. of Wenonah, New Jersey.

Technical Press Review—July

Atomics and Nuclear Energy.—Radiation and Encapsulation; Accelerated Electrons for Commercial Irradiation; Cadmium Sulphide for Radiation Detectors; New Particle Accelerators; Irradiation in the Motor Industry; Isotopes in Meteorology; Ground Disposal of Atomic Waste—2.

Automation Progress. — Industrial Electronics has come of Age; Analogue Computer Predicts Radioactive Fallout; Semi-conductors and their Uses; Production Control in the German Motor Industry; Instrumentation of Process Plant; Production and Handling.

Chemical and Process Engineering.

— Packed Fractionating Columns;
Mechanisation in the Laboratory;
World's Newest Paper Board Mill.

Paint Manufacture — Indian Paint Industry Progress; Labels; Silent Salesmen; Extensions to PATRA House; Fundamental Studies of Adhesion.

Food Manufacture.—Jam-making the Modern Way; Success with Meat Products; Meat Products Additives; Hygienic Preparation of Meat Products; Danish Meat Product Laboratory; Equipment Review; Elimination of Pathogens from Frozen Whole Egg—2.

Dairy Engineering.—Some Implications of Automation in the Dairy Industry; Advanced Mechanisation—The Way to Automation; Plant, Equipment and Services for Automation; The Function and Application of Refrigeration in the Dairy Industry; Largescale Processed Cheese Plant.

World Crops.—Production from the Hills; Forage Crops and Silage; Pasture Grasses and Legumes in Northern Ireland; Grasses for Grazing in East Africa; National Silage Demonstration; The Need for Lime.

Corrosion Technology. — Water Treatment for Domestic Hot Water Supplies; Boiler Water Treatment to Eliminate Corrosion and Scale; Corrosion and Water Treatment; Magnetic Treatment of Liquids for Scale and Corrosion Prevention; Protection Against Corrosion in the Petroleum Industry; I.C.I.'s new Wrought Titanium Plant.

New premises for Hall, Forster

Hall, Forster and Co. Ltd., manufacturing chemists, are having warehouse, office and packing department premises built in Temple Street, Newcastle upon Tyne.

Comité International de la Détergence

Following the constitution of the provisional Comité International de la Détergence (International Committee on Detergents) during the 2nd International Congress on Surface Activity in London in April 1957, a meeting of some 50 French and foreign delegates was held in Paris on April 15, during which the Comité International de la Détergence (C.I.D.) was formed.

The C.I.D. intends to work in close collaboration with such international bodies as International Organization for Standards, and the International Union of Pure and Applied Chemistry. Its prime purpose is the preparation of international standardisation of terminology, analysis and testing methods.

With this in view, three Technical International Commissions have already started work, under the chairmanship of specialists who, on April 15, gave an account of what had been achieved so far.

The C.I.D. elected as President of its Bureau, Mr. Léon Duverger, President of the Comité Français de la Détergence. The Vice-President is Dr. Walter Hagge, President of the German Committee on Detergents.

The next World Congress on Surface Activity will be held in Western Germany in 1960. It will be organised by the German Committee on Detergents.

The Secretariat of the C.I.D. is at 70 Champs-Elysées, Paris (8°), France.

Changes of address

The British Chemical and Dyestuffs Traders' Association have moved to 12B, Westminster Palace Gardens, Victoria Street, London, S.W.1, telephone Abbey 5292.

Chemical Construction (Great Britain) Ltd. will be moving into the new building, Henrietta House, Henrietta Place, London, W.1, in July. Telephone Langham 6571. Telegrams— Chemiconst Wesdo, London. Cablegrams—Chemiconst, London.

Ciba (A.R.L.) Ltd.

The name of Aero Research Ltd., is to be changed to CIBA (A.R.L.) Ltd. on June 30.

Aero Research was formed in 1934 to pioneer research into aircraft structures, but in the last 20 years the range and extent of its activities have radically changed and its Duxford factory is now the foremost supplier of synthetic resin adhesives in the United Kingdom, with products used in every major industry. The company was bought by Ciba some years ago.

CHINA

Chemical projects

This year it is planned to start on the building of 87 new factories and workshops for the production of synthetic ammonia, nitrogenous and phosphate fertilisers, synthetic rubber, synthetic kapron fibre, penicillin and streptomycin and other chemicals. A new chemical centre is scheduled for Huainan, Anhwei. Construction has begun on a fertiliser plant with an annual capacity of 420,000 tons of ammonium sulphate.

COLOMBIA

Drugs for coffee

The Roche Co. of Switzerland is reported to have arranged with the Colombian Ministry of Health and other bodies for the import into Colombia of 600,000 dollars worth of antibiotics and other medical supplies, in exchange for coffee.

IRAO

First pharmaceutical plant

Iraq's first pharmaceutical factory was recently opened by King Faisal. It was built by the Iraqi Pharmaceutical Industry Co. Ltd., under the supervision of Union Chimique Belge. It will produce tablets, syrups, ointments and ampoules.

KOREA

Fertiliser contract

The Korean Government and a West German combine have signed a contract for the construction of an urea fertiliser plant at Naju in southwest Korea. The plant, which is to have an annual production capacity of 85,000 tons, is scheduled for completion by the end of 1960. It is expected to cost U.S. \$23.5 million plus Hwan 2,500 million for local expenses.

Talc plant rebuilt

A tale plant, re-equipped and modernised with U.N.K.R.A. aid, is now in production at Chungju in Chungchong Pukto province. Although it has been in existence since 1943, production at the plant, which is owned by the Il Shin Industrial Co., has hitherto been restricted to small quantities of coarse tale of use only in paper, textile and soap manufacture. With the new equipment the production of 500 metric tons of fine ground tale a month will be possible, which is 78% higher than the previous monthly output of coarse tale.

SPAIN

Chemical developments

The Ebro sugar company is to raise its citric acid production from 600 to 900 tons p.a. (investing 10 m. ptas.).

A Serra (Barcelona) is preparing a pilot plant for the output of 3.5 tons p.a. phosphorous acid.

Acetone alcohol, acetic anhydride and other products have been decontrolled.

The technical employees of the Spanish chemical industry during 1957 numbered nearly 5,500. The main branches were pharmaceuticals with 16-8% of the personnel, acids with 16-4%, chemical trade 8-7% and rubber 8-2%.

HOLLAND

First synthetic glycerin plant in Europe starts production

The first plant for the manufacture of synthetic glycerin from propylene in Europe (the only one outside the United States) has now come on stream at the Pernis (Rotterdam) refinery of the Royal Dutch/Shell Group of Companies.

Operating on a continuous basis, it is the final section of a complex installed for the manufacture of a range of related industrial chemicals, the first unit of which was brought on stream in December 1956. These products will make a valuable contribution to the reduction of dollar imports.

The synthetic process, which yields glycerin of extremely high purity, has been applied in the United States on a large scale by Shell Chemical Corporation for some years now. The product fully meets the requirements of the food and pharmaceutical industries.

ISRAEL

De-salting project

According to the Negev Institute for Arid Zone Research, construction work has started on a 1£200,000 laboratory for research on desalting of brackish water. The 450 sq. metre building will contain a pilot plant for water desalination as well as chemical laboratories for the preparing and testing of filter membranes.

New ultra-centrifuge

The Weizmann Institute of Science, Rehovot, is to acquire a new analytical ultra-centrifuge as the result of a grant by the U.S. National Institute of Health. The apparatus is used in research on proteins, nucleic acids, etc.

AUSTRALIA

Polythene plant in production

The highly mechanised £2,250,000 polythene plant of the Imperial Chemical Industries of Australia and New Zealand Ltd. is now in production. A further £1 million will be expended later to double the productive capacity of this plant.

More overheads?

The chemical industry in New South Wales will be faced with additional costs if the State Government goes ahead with its plan to pay women workers the same rates as men. Some 200,000 women will be affected by this change, each to the tune of about an extra £3 a week.

Chrome chemicals assistance?

The Tariff Board, inquiring "What assistance should be accorded the manufacture in Australia of chromium oxide, sodium bichromate, potassium bichromate, basic chromium sulphate, chromic acid and sodium chromate, expects that Chrome Chemicals (Australia) Pty. Ltd. will lodge the following request: That the rates of duty on all these chemicals be increased by 10% above the current rates of duty, to make such rates 35% British preferential tariff and relative rates under the other columns in the schedule to the Customs Tariff.

CENTRAL AFRICA

Allenbury's new building

Allen and Hanburys Ltd. have opened a warehouse and offices in Salisbury. As recently as 1954 the development of the company's affairs in the Rhodesias was confined to periodic visits by their pharmaceutical and surgical representatives.

The rapid build-up in the demand for the company's medical specialities, pharmaceutical and surgical products, and the difficulties in distribution arising from the great distances involved, made it imperative that stocks be held within the territory.

Early in 1956 a branch of the company's surgical division was established in Salisbury, offering the medical profession and the Government medical services "on the spot" stocks of surgical instruments and hospital equipment.

Later a substantial industrial site at Southerton, some four miles from the centre of Salisbury, the Federal capital, was acquired. In addition to distributive services, the new building is planned to accommodate plant and equipment for pharmaceutical manufacturing.

New Products

" Cosmetic detergent "

A new type of detergent was launched in London recently.

Called Softly, it is described by the manufacturers, Domestos Ltd., as a cosmetic detergent since it is designed primarily for washing delicate fabrics. It is a pink liquid which is squeezed from a lightweight press pack. Advantages claimed for this pack are that it is unbreakable and cannot spill or get soggy.

Garments washed in Softly are said to retain a pleasant fragrance. The product contains a freshening agent. Glycerin is included to protect the hands. It retails at 2s. 6d.



A non-sedative antihistamine

Imperial Chemical Industries Ltd. Pharmaceuticals Division have added to their range of medical products Nilergex. This is 10-(2-Dimethylaminopropyl) - 9 - thia - 1 : 10 - diaza - anthracene (Isothipendyl) and is said to possess powerful antihistaminic and anti-allergic properties, coupled with a remarkable freedom from side effects, particularly sedation. It is indicated in the symptomatic control of allergies such as hay fever, vasomotor rhinitis, allergic dermatoses, food allergies, insect bites and stings and motion sickness.

Nilergex, which is not a scheduled poison, is available in three dosage forms—in tablets of 4 mg. for routine use, as Nilergex S.A. (sustained action) coated tablets of 12 mg., and as a pleasantly flavoured syrup especially suitable for pædiatric use, containing 2 mg. of Nilergex in each teaspoonful (3.5 ml.).



Shampoo base

A new type of detergent has been added to the range of Cyclo Chemicals Ltd. Called Cycloryl, it is an almost colourless and odourless clear liquid and is the sodium salt of a sulphated, ethoxylated lauryl alcohol. Its properties are said to include resistance to hard water, stability over a wide pH range, simple viscosity control, and good foaming properties.



Sun tan pill

A pill which has been launched on the American market will, it is claimed, enable people to acquire a summer's tan in two weeks. It is made from the drug methoxsalen and is at present sold only by prescription. The makers, Upjohn Co. of Kalamazoo, Michigan, warn that the pills must not be taken for more than 14 days running.

Chemical detector crayons

Sensitive detector crayons for the detection of phosgene, hydrogen cyanide, cyanogen chloride, cyanogen bromide and lewisite are now commercially available from the Aromil Chemical Co., Baltimore, U.S.A.

It is reported that these crayons will write on paper, wood or any other suitable writing surface, and the resulting mark will turn to a distinctive colour when exposed to very low concentrations of the appropriate gas.

Since each crayon is said to be good for hundreds of tests, Aromil claims that they provide a simple, convenient and inexpensive means to test for the presence of these toxic gases, and for detecting and locating leaks in cylinders and gas containing systems, particularly in chemical factories.



Rauwolfia products

Safety and high potency with fewer and milder side effects are claimed for Harmonyl—Abbott's new alkaloid of Rauwolfia canescens.

It has been tried in conditions varying from mild anxiety to major mental illnesses and hypertension. The drug is reported to have exhibited significantly fewer and milder side effects in comparative studies with reserpine, while demonstrating effectiveness comparable to the most potent forms of rauwolfia.



Stronger vasodilator

Perdilatal Forte tablets have been introduced by Smith and Nephew Ltd. as a stronger form of their vaso-dilator Perdilatal.

Each tablet contains 6 mg. of the phenyl iso butyl derivative of phydroxy ephedrine recently given the approved name buphenine hydrochloride. Perdilatal forte is intended to simplify administration in patients requiring the larger doses now being employed in certain cases.

The greatest vasodilator effect of perdilatal is on the muscles rather than on the skin state Smith and Nephew. This action, they say, makes it particularly suitable for deeply seated peripheral vascular disorders which benefit from the prolonged vasodila-tion provided by the drug; more blood is supplied to the distressed blood vessels and the subsequent circulatory improvement relieves pain and restores warmth and colour to feet, legs and Perdilatal has been used in intermittent claudication, Raynaud's disease, incipient gangrene and thrombophleibtis. A box of 50 tablets retails at 6s. 9d., exempt P.T.

Moth proofer

A mothproofing agent which has been used for some time on carpets is now said to give permanent and economical protection to wool-containing goods and other keratinous materials. Known as *Dielmoth*, it is a development of the Shell Chemical Co.

Application is simple and involves little or no extra processing. It is recommended that 0·1% by weight of *Dielmoth* should be applied on the weight of the textile material to be treated. It is usually introduced directly into an acid dyebath, where it readily exhausts itself on to the wool together with the dyestuffs themselves. The product does not, it is stated, affect the dyes or chemicals normally used in dyeing.

The proof applied in this way remains fast to all ordinary washing and dry cleaning operations and also to exposure to sunlight and wear and tear. Labels have been designed by Shell for attachment to fabrics and garments which have been treated with *Dielmoth*. This guarantees that they are permanently mothproof and quite safe to user and wearer.



Sparkling bath cubes

A combination of Austrian and Siberian pine needles provides the perfume for bath cubes recently introduced by Cusson, Sons and Co. Ltd. They are effervescent and dissolve quickly in the bath water.



Insect repellent cream

A recent introduction of Imperial Chemical Industries Pharmaceuticals Division is Flypel, a non-greasy insect repellent cream. It contains m-diethyl toluamide which is claimed to be effective against flies, midges, mosquitoes and other biting insects.

Packing: 30 g. tubes retailing at 3s. each, trade price 21s. per doz. plus 6s. 4d. tax.



"Hydro-seve"

Hydro-seve—a distillate of flowers—is contained in a new range of beauty preparations introduced into this country from France by the Laboratoires du Dr. N. G. Payot. The range is called *Stimulation* and includes a tonic lotion, a cream powder base and a tinted make-up cream.

Munro Vitarex Ltd. of London, distributors for Payot, describe *Hydro*seve as a distillate of flowers without any added synthetics.

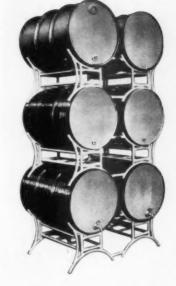
Packaging

Frum storage units

Powell and Co. have designed a unit which allows steel drums to be stacked up to five tiers high by means of a fork lift truck. Each drum is securely eradled and the forks are safely positioned under the load during

stacking operations.

The units are of lightweight tubular steel and can be carried by one man. Each unit holds two drums and no permanent fixtures are required to enable drums to be stored neatly and safely either indoors or outdoors. Contents of drums can be drawn off via end bung if required.



With these Powell designed units, steel drums can be stacked up to five tiers high by means of a fork lift truck.

Banding tape Sellotape reinforced banding tape has been introduced to cut material and labour costs in strapping standard cartons and bales, in banding operations and in holding spares to main units in transit. It needs no tensile machine or special equipment.

Comprising ninety 300 denier rayon threads laminated to each inch width of vinyl film, the tape is waterproof, obtainable in natural, red, yellow, blue and green, and can be printed for publicity, identification or coding.

It is distributed by the Industrial Sellotape Division of Gordon and Gotch Ltd.





Reversible pourer spouts enable the Armadillo container to be packed away after use and stacked on top of one another.

The Armadillo

The Armadillo is a 10-gal. container composed of an outer steel drum and an inner semi-rigid polythene liner. The bottom of the drum is recessed for easy and secure stacking.

It has been developed as a cooperative effort between Reads of Liverpool who supply the drum, and Cascelloid of Leicester who supply the inner polythene container.

They anticipate that the Armadillo will be particularly welcome to those who transport and store acids, chemicals or other corrosive liquids.

The pourer spout supplied with each drum is reversible so that after use it can be packed away and the drums stacked one on top of another. The container needs no outer packing and conforms to Post Office and Transport regulations governing the transport of liquids by road, rail, sea and air. It is said to be a space-saver, taking up far less room than the more conventional chemical containers.

Contents are safeguarded by an anti-pilfer seal and, being a fullaperture drum with a hoop closure, the polythene liner can be completely removed.

All parts are replaceable. The outer container can be decorated to the purchaser's requirements.

NEW COMPANIES

These particulars of new companies have been extracted from the daily register of Jordan and Sons Ltd., company registration agents, Chancery London, W.C. 2.

Frederick C. Devon and Co. Ltd. 17.4.58. 17 Philpot Lane, London, E.C.3. Chemists, druggists, drysalters, etc. £5,000. Dirs.: Herbert C. and Norris H. Devon.

Noxoid Products Ltd. 22.4.58. 128 Crawford Street, London, W.1. Manfrs. of and dlrs. in chemicals, chemical products, etc. £100. Subs.: Denis S. C. and Mrs. Rose E. Dixon.

W. E. Waite Ltd. 9.4.58. Druggists, ysalters, oils and colourmen, etc. drysalters, £1,000. Dirs.: Wm, E. and Mrs. Ann V. Waite.

W. A. Hornsey Ltd. 10.4.58. 49 Chapel Road, Worthing. Chemists, etc. £2,500. Dir.: Walter A. Hornsey.

A. H. Robins Co. Ltd. 28.3.58. Chancery Lane, London, W.C.2. Manfg. chemists, etc. £2,000. Subs.: Eugene chemists, etc. £2,000. Subs.: Byrne and Lancelot H. Thwaytes.

J. Bass (Harold Hill) Ltd. 31.3.58. Manchester Street, London, W.1. Chemists, druggists, etc. £1,000. Dirs.: Joseph Bass and H. Hopkins.

Miner's Makeup Ltd. 31.3.58. Hook Rise, Kingston-by-Pass, Surbiton, Surrey. Manfrs. of and dirs, in beauty products, etc. £1,000. Dirs.: Wm. Paul Kavanagh and Stanley H. Ficker.

G. R. Lanes Charabs Ltd. 1.4.58. Horton Road, Gloucester. Manfg. chemist. £12,000. Dirs.: Gilbert and Mrs. Grace J. Lane.

J. R. Hayes and Son Ltd. 1.4.58. 1 Gayton Road, Kings Lynn. Pharmaccutical chemists, etc. £1,000. Dirs.: James R., Sydney R. and Leonard R. Hayes.

John Sharpe (Chemists) Ltd. 1.4.58. 1089B Chester Road, Pype Hayes, Bir-mingham. £1,000. Dirs.: John and Mrs. Helen Sharpe.

E. Miller Ltd. 1.4.58. Chemists, etc. £2,000. Dirs.: Mrs. E. F. Masterton, 31 Provost Road, Dundee, and Miss Thelma Navliss.

Rainbo Pharmaceuticals Ltd. 2.4.58. 9 Arundel Street, Strand London W.C.2. Dirs.: John Ramage and Stanley W. Goody.

W. B. Hubble Ltd. 2.4.58. Chemists, etc. £1,000. Subs.: Alan A. Spears and Hugh C. R. Clunie, 61 Carey Street, London, W.C.2.

Chaperlin and Jacobs Ltd. 6 40/42 Oxford Street, London, Chemists and druggists, etc. Dirs.: Edward L. Chaperlin and John L. Jacobs.

Solent Pharmacy Ltd. 9.6.58. 231 London Road, Waterlooville. Chemists, druggists, etc. £1,000. Dirs.: Ernest C. and Mrs. Jessie Sleep.

Kenilworth Pharmacy Ltd. 9.6.58. 12 The Square, Kenilworth, Warwicks. £3,000. Dirs.: Albert Haythornthwaite and Leslie Gaskins.

Paul Freres Ltd. 13.6.58. 17 Dartford Road, Bexley, Kent. Chemists druggists, opticians, etc. £100. Dirs.: Joseph A. W. and Mrs. Elizabeth R. Perkins.

Clark and Howes (Fareham) Ltd. 13.6.58. 15 West Street, Fareham, Hants. Chemists, druggists. £3,000. Dirs.: Roy E. Clark, Philip G. Howes, Phyllis M. Clark and Peter K. Fagg.

THE CHEMICAL MARKET

SEVERAL PRICE INCREASES

LONDON.—The price of atropine sulphate has risen considerably, from £51 2s. kg. to £59 18s. 6d. The minimum price quoted for caustic soda is £37 0s. 6d. Calcium chloride, formerly £15 17s. 6d. ton is now £16 10s. Soda ash prices range from £17 10s. 6d. ton. Zinc oxide is dearer by £1 10s., bringing it to £102 ton. Lower prices are reported for thiamine hydrochloride, 100 g. lots being reduced by ½d. to 4d. g., and 1 kg. lots from £14 2s. 6d. kg. to £13 7s. 6d. a-Tocopherol is down by 1d. to 1s. 1d. g. Gums and waxes continue to fluctuate.

| FINE CHEMIC | CALS | Ferri ammoniu |
|---|----------------------------|--------------------------------|
| Acetanilide | | 1-cwt. lots, |
| 12½ kg. | 7s. 4d. kg. | 1-cwt. lots, |
| Arsenious oxide B.P. 7-lb. lots | 1 a 0.4 lb | Ferrous glucon |
| 1 cwt. lots | 1s. 9d. lb. 1s. 2d. lb. | 1 cwt. lots Gallic acid B.I |
| Ascorbic acid | 18. 20. 10. | 1-cwt. lots |
| 100 kg. | £4 14s. kg. | Glycerophosph |
| Aspirin | er rass ng. | 24 litres |
| 56 lb. | 5s. 2d. lb. | Glycine (amine |
| 1-cwt. | 4s. 11d. " | 12½ kg. |
| 5-cwt. lots | 4s. 9d. ,, | Hexyl resorcing |
| Atropine | ** | Hydroquinone |
| Sulphate, 500 g. & | | Iodides |
| | 59 18s. 6d. kg. | Ethyl |
| Alkaloid, 500 g. | £69 10s. kg. | 3½ kg. bo |
| Benzene B.P.C. 28-lb. lot | | 20-litre d |
| Benzoic acid 12½ kg. | 7s. 4d. kg. | Mercury, re |
| Benzyl benzoate | | 28-lb. lot |
| According to pack 5s | | . 1-cwt. lot |
| Bismuth oxide B.P.C. 193 28-lb. lots | 26s. 10d. lb. | Potassium l 28-lb. lots |
| Bismuth salts 28-lb. lots: | 205. Tou. ID. | 1-cwt. lot |
| Carbonate | 22s. 3d. lb. | Sodium B.F |
| Subgallate | 21s. 1d. " | 28-lb. lots |
| Salicylate | 21s. 9d. ,, | 1-cwt. lot |
| Subnitrate | 20s. 5d. ,, | Iodine, Chilean |
| Borax B.P. | | 99% min. in |
| Powder (hessian bags) | £58 10s. | |
| n (paper bags) | £57 10s. | Iodoform |
| Extra fine (hessian bag | | 12½ kg. and |
| " " (paper bags | £58 10s. | Lactose 50 kg. |
| Boric acid B.P. | 000 10- | Lithium salts 5 |
| Crystal (hessian bags) | £96 10s. | Benzoate |
| ,, (paper bags) | £95 10s. £94 | Carbonate I |
| Powder (hessian bags) ,, (paper bags) | £93 | Chloride (co |
| Bromine B.P.C. | 200 | ., gra |
| 7-lb. lots | 6s. lb. | Hydroxide |
| Caffeine 50 kg. | 42s. 6d. kg. | Citrate B.P. |
| Calamine 50 kg. | 4s. kg. | Sulphate |
| Calcium gluconate | | Salicylate, 1 |
| 1 cwt. lots dlvd. | 33. 7d. lb. | Magnesium car |
| Calcium glycerophosphate | | Light cwt. l |
| 50 kg. | 28s. 6d. kg. | Magnesium tris |
| Calcium lactate B.P. | | 28-lb. packa |
| 7-lb. lots | 3s. 6d. lb. | 28-lb. lots |
| 1-cwt. lots | 2s. 11d. ,, | 1-ewt. lot 5-ewt. lot |
| Chloral hydrate 50 kg. Citric acid, B.P. | 10s. kg. | Bulk rates |
| Powder or granulated: | | from 3s |
| 1-cwt. lots | £11 5s. cwt. | Manganese hyp |
| 5-cwt. lots | £11 ,, | 7-lb. lots |
| Codeine | ,, | 1-cwt. lots |
| | 06 7s. 6d. kg. | Mercuric chlor |
| Phosphate 100 g. | £110 " | 50-kg. lump |
| Ephedrine 500 g. lots | | Methyl salicyla |
| Hydrochloride 3 kg. & | 6 12s. 3d. kg. | Morphine |
| Alkaloid 3 kg. | £12 7s. kg. | Alkaloid, 10 |
| | 6 12s. 3d. " | Nicotinamide 1 |
| Eucalyptol | | Nicotinic acid |
| 1-cwt. lots | 12s. 6d. lb. | 121 kg. |
| 5-cwt. lots | 12s. ,, | 1 kg. |
| 4 | | |

| xes continue to fluctua | ate. |
|-------------------------|----------------------|
| Ferri ammonium citra | ite B.P. |
| 1-cwt. lots, scales | 4s. 8d. lb. |
| 1-cwt. lots, granul | |
| Ferrous gluconate | 001 2200 99 |
| 1 cwt. lots dlvd. | 6s. 3d. lb. |
| | 0s. ou. 10. |
| Gallic acid B.P.C. | 0- 04 |
| 1-cwt. lots | 9s. 8d. ,, |
| Glycerophosphoric ac | |
| 24 litres | 11s. 10d. litre |
| Glycine (amino acetic | |
| 12½ kg. | 18s. 10d. kg. |
| Hexyl resorcinol 10 k | g. £7 10s. kg. |
| Hydroquinone 121 kg | . 23s. 10d. kg. |
| Iodides | |
| Ethyl | |
| 3½ kg. bottle | 54s. 3d. kg. |
| 20-litre drum | 115s. litre |
| Mercury, red B.P. | C |
| 20 lb lote | 27s. lb. |
| 28-lb. lots | |
| . 1-ewt. lots | 26s. " |
| Potassium B.P. | |
| 28-lb. lots | 8s. 6d. ,, |
| 1-cwt. lots | 8s. 3d. ,, |
| Sodium B.P. | |
| 28-lb. lots | 13s. ,, |
| 1-cwt. lots | 12s. 9d. ,, |
| Iodine, Chilean crude | |
| 99% min. in wood | |
| 00 /0 mm m wood | 15s. kg. |
| Iodoform | 105. kg. |
| 12½ kg. and under | 20 kg 49a 6d kg |
| Tastess 70 ha | 90 kg. 428. 00. kg. |
| Lactose 50 kg. | 3s. 2d. kg. |
| Lithium salts 5-cwt. le | |
| Benzoate | 10s. lb. |
| Carbonate B.P.C. | 11s. 3d. ,, |
| Chloride (commerc | eial) powder |
| | 11s. " |
| ., granular | 10s. 9d. " |
| Hydroxide | 9s. 9d. ,, |
| Citrate B.P.C. | 9s. ,, |
| Sulphate | 8s. 6d. ,, |
| Salicylate, 10 cwt. | |
| Magnesium carbonate | , diva. 9s. 9d. " |
| Magnesium carbonate | D.F. |
| Light cwt. lots dlv | d. £129 ton |
| Magnesium trisilicate | |
| 28-lb. packages | |
| 28-lb. lots | 4s. 3d. lb. |
| 1-cwt. lots | 3s. 10d. ,, |
| 5-cwt. lots | 3s. 7d. ,, |
| Bulk rates for lar | |
| | o. in 1 ton lots |
| Manganese hypophosp | hite R.P.C. |
| | 13s. 11d. lb. |
| 7-lb. lots | |
| 1-cwt. lots | 12s. 11d. " |
| Mercuric chloride B.P | |
| 50-kg. lump | 48s. 6d. kg. |
| Methyl salicylate 1-cw | vt. lots 3s. 3d. lb. |
| Morphine | |
| | £138 18s. 4d. kg. |
| Nicotinamide 1 kg. | £4 10s. kg. |
| Nicotinic acid | |

| returnable carriage p | eles ton |
|--|--------------------------|
| Phenolphthalein 50 kg. Phosphoric acid B.P. | £165 ton 24s. 3d. kg. |
| (s.g. 1·750) 10 carboy Potassium permanganate | |
| 1-cwt. lots dlvd. | 1s. 11 d. lb. |
| Procaine hydrochloride | (foreign) 2 kg |
| Procaine nydrocinoride | 59s. kg. |
| Quinine 1 oz. lots | 4s. 4d. oz. |
| Riboflavin | 48. 4u. UZ. |
| | #1d a |
| 100 g. | 5½d. g. |
| 10 g. | 7d. " |
| Saccharin | ALI |
| | or this quantity |
| Salicylic acid | d to % od lb |
| | d. to 5s. 6d. lb. |
| Silver nitrate | 4- 1111 |
| 500 g. | 4s. 11\d. oz. |
| Sodium benzoate B.P. | 0 011 11 |
| 1-cwt. lots | 2s. 9½d. lb. |
| 1-ton lots | 2s. 7 d. " |
| Sodium salicylate | |
| 50 kg. | 8s. 8d. kg. |
| 12½ kg. | 9s. ,, |
| Sodium thiosulphate | |
| Crystals, photograph | ic quality |
| 1-ton lots | 49s. cwt. |
| Stearic acid B.P.C. flak | e. carriage paid |
| G.B. | £154 ton |
| Strychnine 25 oz. | |
| Alkaloid | 5s. 10d. |
| Hydrochloride | |
| Sulphate | 4s. 11d. 4s. 11d. |
| | 45. 110. |
| Sulphaguanidine | 00- 1 |
| 12½ kg. | 33s. kg. |
| 50 kg. | 32s. " |
| Sulphanilamide | 10- 04 1- |
| 12½ kg. | 16s. 6d. kg. |
| 50 kg. | 15s. 4d. " |
| Sulphathiazole 12½ kg. | 39s. 1½d. kg. |
| Tannic acid B.P. Levis | 10- II- |
| 1-cwt. lots | 10s. lb. |
| Tartaric acid B.P. | |
| Powder or granulated | 1, |
| 10 cwt. or more | £14 cwt. |
| Terpineol, B.P. | |
| 40-gal. drums 1-cwt. lots | 2s. 5d. lb. |
| 1-cwt. lots | 2s. 8d. " |
| Theophylline, B.P. | |
| 500 g. 27s. 6d. fc | or this quantity |
| Thiamine hydrochloride | |
| 100 g. | 4d. g. |
| 1 kg. | £13 7s. 6d. kg. |
| Thioglycollate | |
| Ammonium 12s. 4d | . to 16s. 4d. lb. |
| Calcium: | |
| 7-lb. lots | 17s. 3d. " |
| 5-ewt. lots | 14s. 3d. " |
| a-Tocopherol 10-g. lots | 1s. 1d. g. |
| | . to 30s. 6d. lb. |
| | . 10 005. 00. 10. |
| Zinc oxide, B.P. | 0100 to- |
| 2-ton lots | £102 ton |
| GENERAL CHE | MICALS |
| Acetic acid 1-ton lots dl | |
| 200/ Technical | vu. |

Oleine, B.P. extra pale, 3/4 cwt. drums

returnable carriage paid G.B.

£99 ton £105 "

£114 "

£111 "

£108 "

80% Technical 80% Pure Glacial B.P.

99-100% Glacial 98-100% Glacial

52s. 6d. kg.

55s. "

| cetic anhydride | Magnesium chloride | Sodium sulphate Ex works: |
|--|---|---|
| 1-ton lots dlvd. £143 to | (| (Glauber salt) £13 ton |
| 5-gal. drums, free, non-returnable | Magnesium sulphate | (Salt cake) unground, full truck loads £8 16s. 6d. ton |
| £128 to | | Sodium sulphide |
| 40 to 45-gal. drums, 10-ton lots | Mercurous chloride (calomel) | Broken, returnable drums, dlvd. ton |
| £88 ,, | 50 kg. 65s. kg. | lots £37 2s. 6d. ton |
| Alum, potassium granular crystals | Mercury sulphide, red | Flake, ditto £38 12s. 6d. ,, |
| 50 kg. 1s. 2d. kg | Ton lots and over 30s. 6d. lb. | Solid ditto £36 2s. 6d. ,, |
| Aluminium hydroxide B.P.C. 34 28-lb. lots 2s. 4d. lb | Methylated spirits (Industrial) | Sodium sulphite |
| 28-lb. lots 2s. 4d. lb Aluminium stearate | terranicity dumity ooo gan und | Commercial crystals 4-ton lots £24 10s. " |
| (Precipitate) 1-ton lots £253 10s. ton | upwards: 61 o.p. 7s. 4d. | (Dlvd. London in 1-cwt. single non- |
| Ammonia | 61 o.p. 7s. 4d. 74 o.p. 7s. 11½d. | returnable bags) |
| Persulphate £6 2s. 6d. cwt | 5 to 10 gal.: | Sodium tripolyphosphate |
| Phosphate: Mono- £106 tor | | 1-ton lots £95 ton |
| Di- £100 " | 74 o.p. 9s. 3½d. | Stannic chloride 28-lb. lots 8s. 11d. lb. |
| Amyl acetate | Methyl ethyl ketone | Stannous chloride 28-lb. lots 9s. 5d. lb. |
| B.S.S. 10 tons and over £251 tor | 10 tons dlvd. in drums £143 ton | Strontium carbonate |
| Technical £249 ,, | Methyl isobutyl carbinol | 96-98% 28-lb. lots 3s. lb. |
| Amyl alcohol Technical in 1-ton lots £260 ton | 10 tons and up, in drums, dlvd. | Sulphuric acid, ex-works, according to |
| Technical in 1-ton lots £260 ton Arsenic White powdered ex store | 2100 001 | quality and quantity B.O.V. 78% from 8s. to 10s. ewt. |
| £37-£38 ton | Methyl isobutyl ketone | C.O.V. 96% from 11s. to 14s. ewt. |
| n-Butyl acetate | 10 to 50 tons, in drums, dlvd. £169 ton | Zinc chloride |
| 10-ton lots £173 ton | Naphthalene | 28-lb. lots sticks 6s. 9d. lb. |
| n-Butyl alcohol | Crystal, dlvd., 4-ton lots, spot | |
| 10-ton lots £142 ton | £65 4s. 3d. ton | OILS AND FATS |
| Calcium chloride | Ball and flake (ditto) £73 14s. 3d. ,, | Palm kernel oil |
| Solid 70 to 72%, 4-ton lots dlvd. | Nickel sulphate | Refined, deodorised, 2-ton lots, |
| Calcium avida (Lima) | dlvd. ton lots £200 ton | naked, ex works £118 ton |
| Calcium oxide (Lime) Ex marble 28-lb, lots 3s, 10d, lb, | Nitric acid 70% intermediate £32 ,, | Palm oil |
| Caustic soda | Pentachlorphenol | Refined, deodorised, 2-ton lots, |
| Solid 1-ton lots, from £37 0s. 6d. ton | Flake, technical, 1-ton lots, dlvd. | naked, ex works £108 ton |
| Chloroform B.P. ½-ton lots 3s. 1½d. lb. | 25. 24. 10. | Stearine |
| Chromic acid | include Orystais. | Flake triple-dressed, dlvd. (bags free and non-returnable) carriage paid |
| Dlvd. U.K. (less 2½%) | Under 1 ton dlvd. from 1s. 7d. lb. 10 tons and over dlvd. in returnable | G.B. £149 ton |
| 2s. 0¼d. to 2s. 0¾d. lb. | | 0131 |
| DDT 3s. 01d. to 3s. 2d. lb. | Phthalates | GUMS AND WAXES |
| 2: 4-Dichlorophenoxyacetic acid | 10 ton lots in drums | Agar Agar No. 1 |
| 99% pure, 1-cwt. bags £340 ton | | Kobe strip 12s. 3d. lb. |
| Dimethyl sulphate 400 lb. drum lots | Dimethyl (B.S.) £179 ton | Powder 17s. 6d, |
| 1s. 8d. lb. | Potassium bromide | Beeswax |
| Ether (Di ethyl ether) | 50 kg. 5s. 6d. kg. | Dar-es-Salaam spot (nominal) |
| Tech. B.S.S. and Solvent B.P. | 12½ kg. 5s. 8d. ,, | £29 15 s. ewt. |
| 1-ton lots in drums 2s. lb. | Potassium carbonate | Sudan spot (duty paid) £30 ,, |
| Ethyl acetate 10-ton lots £145 ton | Calcined 96 to 98% (1-ton lots ex store) £76 ton | Bleached white (slab) £38 ,, |
| 95% Gay Lussac 66·0 o.p. | Hydrated (1-ton lots) £74 10s. ,, | Refined yellow (slab) £29 10:. ,, |
| 2,500 to over 300,000 proof gallons | Potassium fluoride | Benzoin Sumatra spot £27 cwt. |
| per year in tank wagons | 28-lb. lots 5s. 1d. lb. | Sumatra spot £27 cwt. Siam spot (nominal) £2 7s. 6d. lb. |
| 4s. 23d. to 4s. 01d. per proof gal. | Potassium sodium tartrate | Candelilla Spot £23 cwt. |
| Ferrous sulphate 50 kg. 1s. 4d. kg. | 5-cwt. lots £10 cwt. | Carnauba |
| Formaldehyde | Soda ash | Prime, Spot £50 cwt. |
| 40% by volume dlvd. England | 1-ton lots dlvd., from £17 10s. 6d. ton | Fatty grey £28 10s. " |
| 1-ton lots £38 15s. ton | Sodium cyanide | Gum arabic |
| Glycerin | 96-98% £128 ton | Lump £7 cwt. |
| 1,260 s.g. chem. pure, 5 tons and up, | Sodium hydroxide 28 lb. lots: | Karaya |
| 5-cwt. drums £201 10s. ton | sticks (1 lb. bottles) 4s. 3d. lb. | Powder, Spot 3s. 6d. lb. |
| 1,260 s.g. refined pale straw, indus., | pellets ,, ,, 3s. 9d. ,, Sodium metal 28-lb. lots 3s. 8d. ,, | Paraffin wax 1-ton lots, acc. to grade |
| 5 tons and up, 5-cwt. drums £196 10s. ton | Sodium metal 28-lb. lots 3s. 8d. ,, Sodium metasilicate | £87 10s. to £120 ton |
| Hexamine 2180 10s. ton | Dlvd. U.K. in ton lots £26 ton | Peru balsam 11s. 9d. lb. |
| 1-ton lots | Sodium phosphate | Shellac |
| Technical, bulk 1s. 8d. lb. | Dlvd. ton lots: Di-sodium, crystal- | No. 1 orange £13 10s. cwt. |
| B.P.C. 1s. 11d. " | line £40 10s. ton | No. 2 orange £11 15s. ,, |
| Hydrochloric acid | Anhydrous £88 " | Transparent white 4s. 4d. lb. |
| Commercial 18s. 6d. cwt. | Tri-sodium, crystalline £39 ,. | Pale dewaxed 6s. ,, |
| Hydrogen peroxide | Anhydrous £86 ,, | Tragacanth |
| 27.5% weight £128 10s. ton | Sodium silicate | No. 1 spot £151 cwf. |
| 35% weight £158 ,, | according to quantity, grade and | No. 2 spot £142 ,, Pale leaf £54 ,, |
| Lactic acid (1-ton lots) Pale tech. 44% by weight 1s. 3½d. lb. | delivery point 4 ton lots £13 10s. ton | Amber £41 ,, |
| Dark tech. 44% by weight 1s. 34d. lb. | 1 ton lots £15 ,, | Brown to Red £30 , |
| - The state of a. 10. | 1 1011 1013 | |

NEW PATENTS

COMPLETE SPECIFICATIONS ACCEPTED

Dvestuffs

Chromium-containing monoazo-dyestuffs and process for making them. Ciba Ltd. 798,472.

Process for dyeing fabrics by means of Farbenfabriken Bayer A.G. pigments.

Manufacture of trisazo dyestuffs. Cassella Farbwerke Mainkur A.G. 798,545. Manufacture of July

Manufacture of lakes of monazo dyes of the benzene-azonaphthalene series and their use. Geigy A.G. 797,850. Process for drying fibres and films of

vinyl polymers and preparation thereof. Ciba Ltd. 799,374.

Derivatives of pyrazole. Foundation Ltd. 798,662. Wellcome

Antibiotics

Factor B an antibiotic component of antibiotic E. Glaxo Laboratories Ltd. 799,053.

Tetracyline by fermentation. Lepetit Soc.

per Azioni. 799, 051.

Organic salts of tetracycline and process for preparing pure teracycline hydro-chloride and acid and metal salts of tetracycline. Bristol Laboratories Ltd. 799,044.

Preparation of insulin. Apoteksvaru-centralen Vitrum Apotekareaktiebolaget. 797,959.

Antibiotic compositions containing oleandomycin. Pfizer and Co. Inc. 799,208.

Steroids

Preparation of steroid compounds. Pfizer and Co. 799,343.

Extraction of purification of sapogenins. Glaxo Laboratories Ltd. 799,047.

Germicides, herbicides etc.

Phenoxy - acetic acids having herbicidal properties. Diamond Alkali Co. 799,435. Fungicides. Farbenfabriken Bayer A.G.

Production of germicidal compositions. Monsanto Chemicals Ltd. 799,400.

Detergents

Detergent compositions. T. Hedley and Co. Ltd. 797,119.

Detergent compositions. T. Hedley and Co. Ltd. 791,704.

Shampoo leaves and a method of producing them. Safodik (Great Britain) Ltd. 790,492

Detergent tablets. Unilever Ltd. 799,075.

Scouring cleansers. Colgate-Palmolive Co. 798,919.

Miscellaneous

Process for the manufacture of unsaturated aldehydes Hoffman-La Roche and Co. A.G. 790,611.

Vinylidene chloride colymer composi-tions. Dow Chemical Co. 790,601. peroxides.

Manufacture of organic Distillers Co. Ltd. 792.558.

Organic compounds containing nitrogen and phosphorus and their manufacture. Ciba Ltd. 792,595.

Method of incorporating water-soluble salts in propellant powder grains. Olin Mathieson Chemical Corporation. 792,820. Sulphur-containing compounds. Boots Pure Drug Co. Ltd. 792,045.

Dehydration of aqueous hydrazine by Genatosan Ltd. extractive distillation.

792.159. Nitro compounds. Du Pont de Nemours and Co. 792,116.

Pyrazole derivatives. May and Baker Ltd. 791,688.

Imperial Chemical Sulphonamides. Industries Ltd. 791,923.
Preparation 2 of-amino-5-mercaptol-1,

3,4,-thiadiazoles. American Cyanamid. Co. 797,469.

Process for producing citric acid by aerobic fermentation of solutions containing molasses

Amides of trialkoxybenzoic acids. Bristol Laboratories Inc. 797,476. Sulphonylurea derivatives. Boehringer

and Soehne Ges. 797,474.

New patents are from the Journal of Patents, and new trade marks are from the Trade Marks Journal. In each case permission to publish has been given by the controller of Her Majesty's Stationery Office Each of the publications mentioned is obtainable from the Patent Office, 26 Southampton Buildings, London, W.C.2.

TRADE MARKS NEW

APPLICATIONS

Cosmetics and toilet preparations

CILCOLOUR .- 767,587. Conté. LANCÔME D'ABORD. - 767,825. Lancôme S.A.

VERS TOI. 771,138. Worth Parfums. FILLE D'EVE. - 767,859. Parfums Nina Ricci.

HIGHLAND MIST .- 773,569. Lavapine Ltd. MY FLAME. — 774,049.

Blaise Perfumes Ltd.
MINERS FIRST STEP.—766,101.

Henry C. Miner Ltd.
DIRECTOIRE FLORÉAL.— 772,128.

Charles of the Ritz Distributors Ltd. ORA .- 773,534. Boots Pure Drug Co.

TAN-TWEED.—774,765. Ltd.

LOVE AFFAIR.-775,339. Goya Ltd. LUX.-774,821. Lever Bros., Port Sunlight, Ltd.

OUTDOOR GIRL NIGHT EXTRA.-

765, 843. Crystal Products Co. Ltd. COEUR - JOIE. — 767,858. Parfums Nina Ricci.

TRICHOTINE. -769,316. Laboratoires des Produits Cosmetiques Jean-Maries. PEGASUS .- 774,122. A. G. Hersom.

Pharmaceuticals

SQUIBB .- 751,277. E. R. Squibb and Sons Ltd.

SENOVET .- 768,983. Westminster Laboratories Ltd.

MIGHTEX.-770,763. MITTEX .-770,764. Henry Fiertag. AQUAPEL.—770,894. Imperial Chemical Industries Ltd.

IOLAN.-771,027. F. W. Hampshire

TEMARIL.—771,228. Smith Kline

and French Laboratories Ltd. PEROLYSEN.—771,488. May and

Baker Ltd. GESICORT .- 771,845. Parke, Davis

Sixty Years Ago

From MANUFACTURING CHEMIST, July 1898

The danger of using petroleum wash for the hair has again been illustrated by a sad accident at Dagenham. Miss Nellie Day, of Coalies Road, Dagenham, had used some, and was stooping down to blow out a candle, when her hair caught fire and she was seriously injured.

A "Botanico" in Spanish does not signify a botanist, but an apothecary, or rather a herbalist; that is to say, one of a class paid by government to collect and to report upon the efficacy of wild herbs and plants. These men pass an examination, as do other practitioners, and go far and wide upon their duties. The Spaniards, it should be noted, are staunch believers in the theory that in every place where certain diseases spring, the Creator has also given us some effective antidote amongst the local herbs.

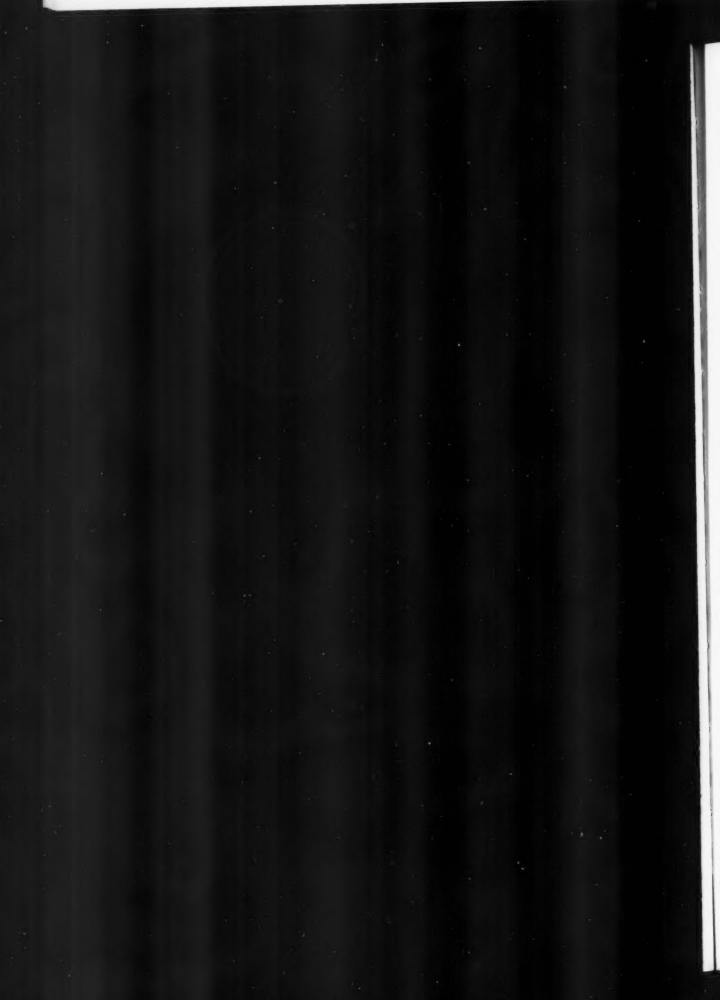
Leonard Hill House, Eden Street, London, N.W.1. Readers requiring names of suppliers of chemicals or plant should state their needs on this form, giving approximate quantities, clip it to their business noteheading and send it to the Bureau, as above. Please type or use block letters.

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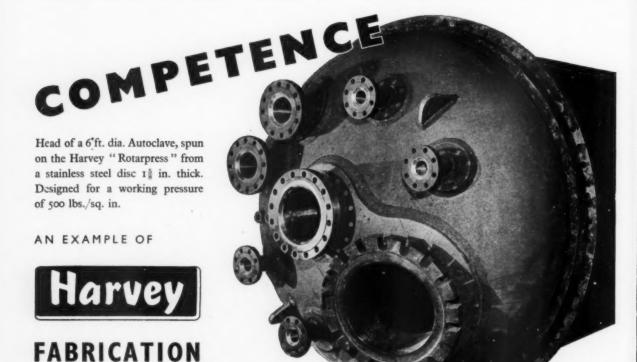
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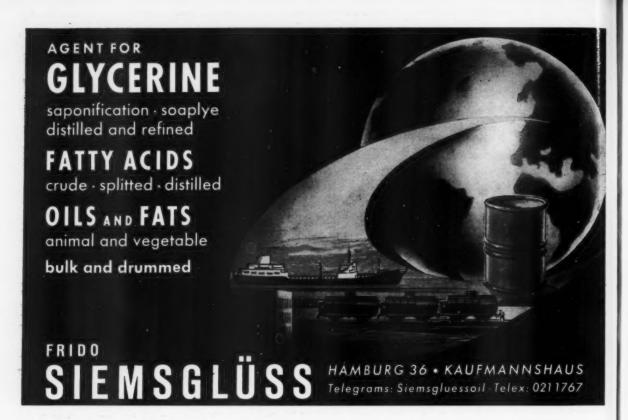
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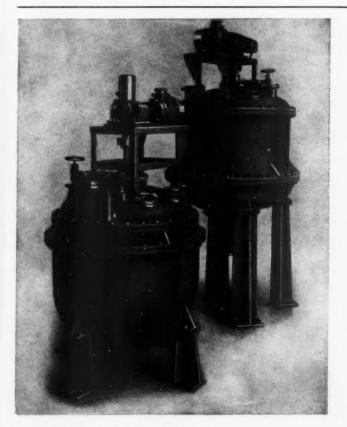
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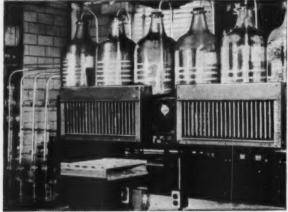
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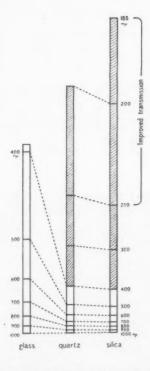
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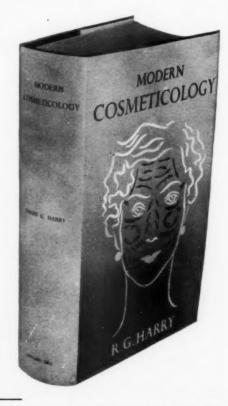
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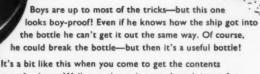


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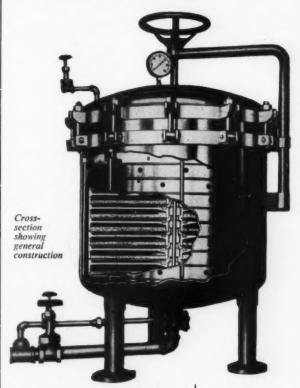
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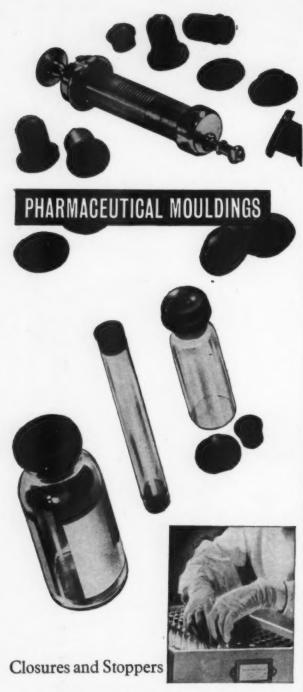
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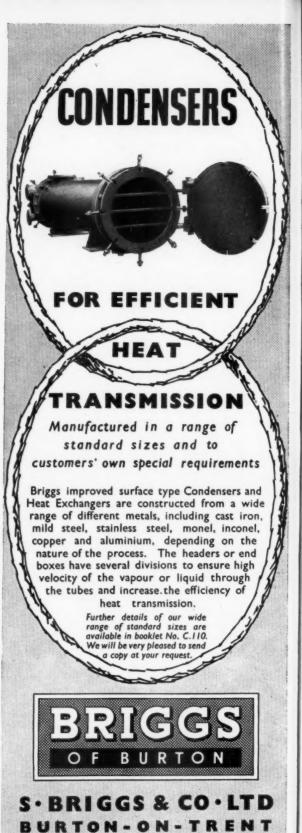


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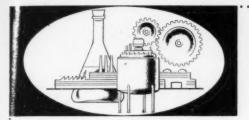
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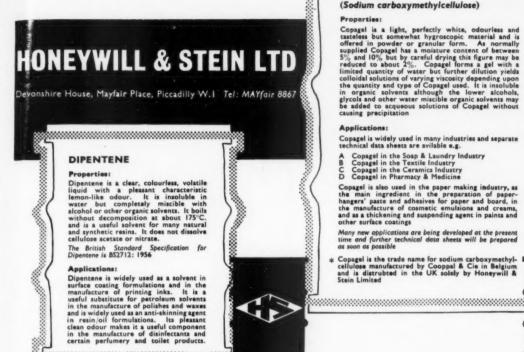
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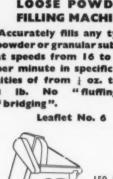
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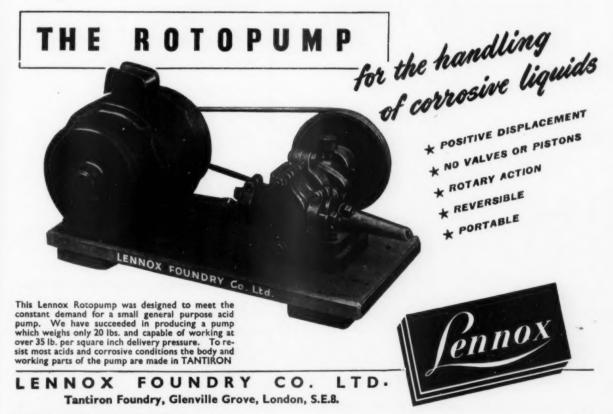
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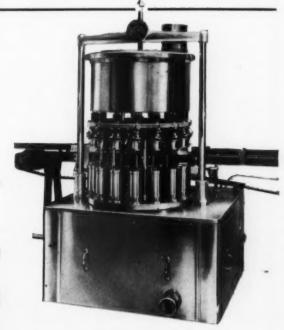
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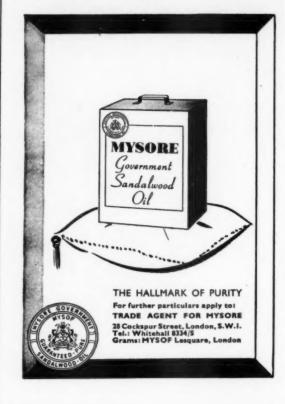
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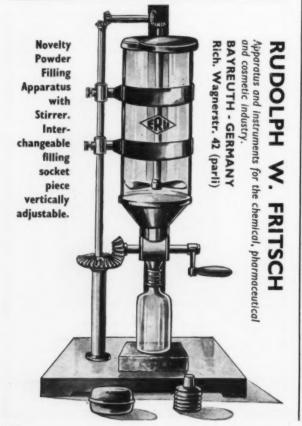
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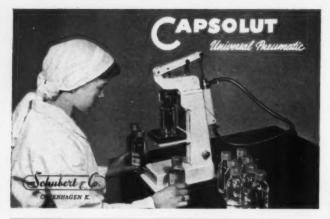
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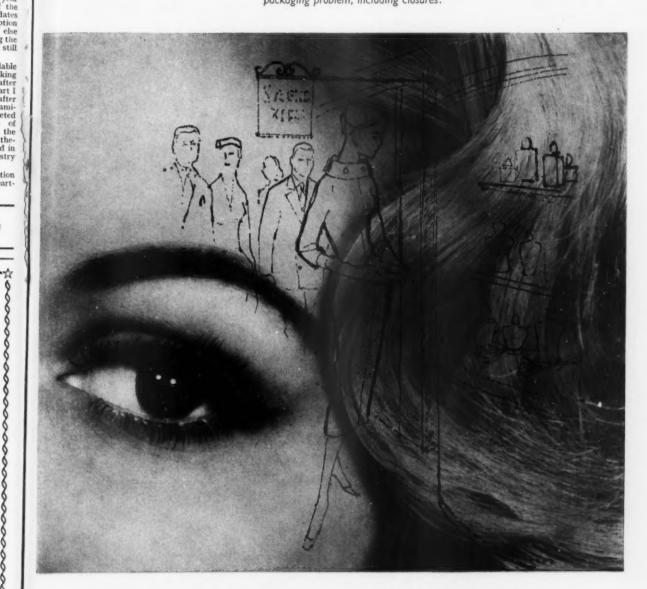
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